This magazine is published to promote sound thought upon and concerning industrial medicine and traumatic surgery. To that end it will contain articles, news items, reports, digests and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited.

Industrial Medicine

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The editors will exercise care in checking on the accuracy of data printed, but in all other respects articles and opinions of which expression is allowed are the opinions of their authors—the editors reserving in all cases the right to comment on the same, in the current or any subsequent issues, as they may be inclined.

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Ideal Physician-Patient Attitude

—In Regard to the Traumatic Patient—

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IT MAY be difficult for the physician or surgeon to conceive the sudden change from security to insecurity of the patient who is being treated for an injury sustained during the course of employment. If we pause for a moment and visualize, we see before us a man who, during the past few years, was employed by a large organization, engaged in an agreeable form of employment, receiving adequate compensation and as a result able to secure the necessities of life and, occasionally, to enjoy luxuries for his family and himself. He may, during this period, have set aside sums of money and established an account in a savings bank, thus giving him a certain sense of financial security and independence.

Suddenly, without warning, he sustains a severe injury causing pain and incapacity, and necessitating frequent visits to the surgeon or physician, with the possibility of surgical interference.

If the injury is a grave one, the patient is hospitalized and is subjected to the diverse routine procedures and the various human reactions of physician, nurse, orderly and attendant. He is thrown into an environment which has hitherto been foreign and unknown to him, and as a result it is difficult for him to adjust himself to the activities of this bewildering and unfamiliar sphere. Simultaneously, he is alienated from his domestic affiliations and his contacts with wife, children and relatives.

If the savings account is meager, he realizes that the normal sustenance at home is becoming much more difficult, and the probabilities that his family may endure physical and mental hardship manifest themselves in his thought.

Keeping such phases of the altered situation in mind, the physician must conjecture that the patient's mental and emotional attitude toward his former status in life might gradually change or become warped, and subsequently his reactions toward his everyday life and his immediate environment become influenced, so as to appear distorted.

An important aspect is that the patient realizes he is not paying for services rendered, inasmuch as the insurance company compensates the physician, and therefore he cannot expect a too-personal interest from the doctor. He may develop an inferior attitude, so that he hesitates to make too-strenuous demands upon nurse or attendant, and frequently may be in discomfort or pain without asking for relief.

A physician who is sincere in giving all patients the benefit of his many years of study and human experience should carefully avoid the development of even an unconscious partiality toward any particular type of patient. Too often, because of the doctor's impersonal attitude and the disregard of a more human understanding, the patient develops an antagonism toward the physician, the insurance company, and the department of labor employees, so that a resultant desire is fostered to "get even" for the imagined slights upon him.

In the injured employee's visits to the insurance company, he is interrogated in an unfriendly and arrogant manner, giving him an impression that his story of the accident is considered fictitious, his degree of disability exaggerated and the severity of his discomfort overemphasized. The natural consequence of such a reception will be to nourish any revengeful impulses which may have originated in the physician's office.

In order to instill an agreeable and cordial feeling in the mind of the injured patient, the initial contact must be conducted in such manner as to create an impression of understanding and personal interest. At the original meeting, when the surgical aid is first rendered, the gentleness, rapidity of emergency measures utilized, and the placing of the patient in the greatest comfort, all help in the formation of confidence in the physician.

Subsequently, when the history is taken, either by nurse or doctor, the method of interrogation and the devices employed to elicit information play an important part in the crystallization of the correct attitude.

THE physical examination of the patient in the privacy of the consultation room, the kindliness, skill and facility with which the examination is performed, and the manner in which the findings are obtained with the minimum amount of embarrassment or physical discomfort to the patient, are all of paramount importance in strengthening the foundation of the right physician-patient relationship.

We have had the experience of examining and treating hundreds of patients who have suffered industrial accidents and as a result have formulated a definite method of examination which aids us in securing a maximum amount of information in a short period of time. The examinee is asked to disrobe completely from head to toe so as to observe him in a natural state, especially as regards position, gait and disposition. While the examination is being conducted, there is an efficient medical secretary in immediate proximity, who records the findings dictated. In the examination, the following important findings are secured:

EXAMINATION:

(a) EYES—Visual Acuity: Right Eye . . . Left Eye. Reading Test: Right Eye . . . Left Eye. Size of Type . . . Distance. Field of Vision: Right Eye . . . Left Eye . . . Normal or Limited. Color Sense: Ability to match colors and call them correctly. Ishihara test used. Pupils: Reaction and accommodation. Puffiness and inflammation of lids and conjunctivitis.

(b) EARS—Appearance . . . Hearing Power . . . By Watch. Right Ear . . . Left Ear. Drums: Scars.

(c) NOSE—Septum: Deviation. Turbinates. Obstruction.

(d) MOUTH AND THROAT: Condition of teeth: Suggested classification for condition of teeth: 1. Good—no repair needed. 2. Fair—minor defects: treatment advisable. 3. Bad—serious defects needing immediate corrective treatment. Condition of gums. Condition of tonsils.

CHEST EXAMINATION:

(a) HEART: 1. Myocardial test. Effort syndrome — Pulse reading before and after exercise. 2. Blood pressure. 3. Valvular disease—compensated or uncompensated. 4. Arrhythmia. 5. Tachycardia. 6. Pulsus alternans. 7. Paroxysmal tachycardia.

(b) LUNGS: 1. Inspection — lagging, apical retractions. 2. Auscultation—Eight points to examine closely as follows: Front: Apex of lung—right and left; infraclavicular space—right and left; Back: Suprascapular space—right and left; base of lung right and left.

ABDOMEN INSPECTION:

ABDOMINAL tumors—rigidity—tenderness. Abdominal wall; scars—adiposity.

HERNIA: Inguinal—complete, incomplete, oblique, direct. Size of external ring. Impulse, present or absent. Femoral hernia. Ventral hernia. Umbilical hernia. Postoperative.

SPINE: Lordosis; scoliosis, kyphosis. Pain on pressure over articular surfaces . . . immobility of trunk. Anus examined for hemorrhoids, fissures, fistulae. Genitals examined for varicocele and hydrocele orcho-epidydimitis, condition of prostate, and urethral discharge.

EXTREMITIES:

(a) LOWER: Varicose veins. Joint motility. Loss of member. Deep reflexes. Foot strain.

(b) UPPER: Joint motility. Loss of member. Loss of digtis. Tremors.

NEUROLOGICAL EXAMINATION:

REFLEXES: Patellar, biceps, ankle clonus. Gait. Romberg.

SKIN: Sensation—eruption.

Finally, the method of treatment, the sincere interest of doctor and nurse in the manipulative procedures, and the maintenance of an unfailing courtesy in arranging future visits, add the finishing touches to a structure of cooperation and mutual esteem.

THE significant question of malingering, which is met so frequently in industrial practice, should be discussed in a paper of this nature. It is extremely difficult to interpret various symptoms, signs, and even objective findings so as to definitely state that the patient either is or is not malingering. Diverse signs have been suggested by eminent authorities in this specific field, which they believe may prove effective in the determination of malingering.

Very frequently an early non-scheduled settlement by the insurance company will be very beneficial in the saving of large amounts of money, because if an early traumatic case is commencing to show signs of conversion, hysteria or traumatic neurosis, that may be nipped in the bud by the outlay of money in termination of the case.

Dr. Leopold Brahdy, in a recent paper, mentioned that even the accepted specificity of the signs of Laseque, Goldthwaite, Patrick and Laguere may be found wanting and are not pathognomonic. He further states that a distinction must be made between malingering and exaggeration of pain, especially as observed in backache and lumbosacral conditions.

The test most frequently resorted to in the attempted proof of malingering is conducted thus: The subject is asked to flex his trunk while in the standing position, and claims inability to comply, due to excessive pain. However, when placed on his back, it is discovered that flexion of the thigh and rotation of the pelvis are normal in range. These findings are inconsistent with the first mentioned, and prove the patient to be definitely malingering.

Before an employee is actually classified as a malingerer, a detailed and exhaustive study should be made. He should be observed without his knowledge at varying intervals to ascertain his normal routine, and whether his alleged disability is carried beyond the examining room.

WE CITE three interesting and somewhat involved cases wherein the physician-patient attitude played an important part in the well-being of our patient, and where, also, the question of malingering became intricate. To date, even though legally the cases are terminated, the physicians who handled these patients have not arrived at a satisfactory conclusion as to the status of malingering.

CASE No. 1.—B. S., male, aged 33, a deckhand, was seen by us two years after the original accident.

History: While working on the dock, he lifted a heavy iron tube, and in the course of this act he slipped on a bolt, and in attempting to hold onto the tube he lost his balance and felt a jolt in his back as though something had broken, and then fell to the ground writhing in pain. He was then taken to the tugboat, where he remained until the next morning. Two days later, he visited a hospital, where he was treated for a while as an outpatient, and then was hospitalized. After his discharge from the hospital, he was treated by the insurance company's physicians for several weeks, and then referred to another hospital, where he was placed in a Bradford frame for five weeks, and then a plaster cast was applied, which he wore for seven weeks following his discharge. He was again treated by the insurance company's physicians until the latter part of July, 1935, when he came under our care.

Examination: He complained of pain in the neck and in the region of the ligament of Nuchae, and he also indicated the lower lumbar region radiating to both hips.

General Appearance: A healthy, robust, individual, 6 ft. 2 in. tall, weighing about 200 lbs. He walked with a marked tilt of the head and shoulders to the left, and presented a typical picture of anxiety neurosis. He had a marked dermographia, indicating a vasomotor disturbance.

The general physical examination was negative except for the spine. He was guarded in all his movements, was restricted in bending the head forward, and complained of pain. There was marked spasm in attempting to manipulate the neck. There was tenderness in the lower lumbar region, with marked muscle-spasm in that area. There were marked bulging and prominence of the muscles on that side, extending from below the dorsal region to the crest of the ilium, which was due to his posture. He complained of tenderness on pressure over the fourth and fifth lumbar vertebrae. X-ray examination revealed no evidence of fracture, dislocation, or osteoarthritis.

This patient was under our treatment, irregularly, for a period of a year, receiving physiotherapy, without much apparent improvement. He was finally hospitalized, and attempts made to examine him under anesthesia, without much success, because of inability to completely anesthetize him. It is interesting to note that a year later we ascertained that he was imprisoned after having committed several robberies.

CASE No. 2.—D. S., female, aged 32, a shopper, was injured June 1, 1935.

History: While shopping for her company, she slipped on sidewalk and fell on her back. Some one helped her up, and she returned to her place of business. She remained in bed the next two days, and on June 4, 1935, reported to the insurance company and was treated there several times. Four weeks after the original injury, she was referred to us for treatment.

Examination: This patient complained of pain in the upper dorsal region, and the back of the neck. Pain in the coccygeal region, which was aggravated by walking or physical exertion. The general physical examination was negative except for the spine. Examination of the spine revealed no spasm or rigidity of the muscles in the upper dorsal region. While standing, there was no restriction of mobility of the spine in any direction, but patient complained of pain in the coccygeal region. In sitting position, she had mild restriction of mobility of spine, due to complaints of pain. There was tenderness on pressure over the coccyx. Vaginal examination revealed slight retroversion, laceration of the cervix, endocervicitis, and marked tenderness in the right cul-de-sac. Rectal examination revealed slight tenderness on mobility of the coccyx, with subsiding pain.

Patrick and Lasegue signs were negative.

X-ray examination by three eminent roentgenologists resulted in diverse interpretations. One stated he believed there was a fracture of the lower end of the coccyx, with posterior and lateral displacement.

The patient was treated for a period of six months by physiotherapeutic and intramuscular procedures, with varied intervals of relief.

It is interesting to note that this claimant had never been employed for consecutively long periods of time, and welcomed the temporary security afforded by regular compensation payments. She then persisted in demanding operative interference for relief, and this became a fixed obsession. After consultation with the insurance physicians, it was decided that operative procedure would be advisable. The coccyx was removed, and the patient made a stormy recovery.

After the case was closed, she resumed her normal work, and pain disappeared. At the present time, she is actively employed and there are no subjective complaints.

CASE No. 3.—J. Y., male, aged 24, painter, was injured April 24, 1934.

History: While working, carrying a plank, he fell into a manhole. His body was stopped by the plank and he held on suspended by his right hand. He was helped out of the manhole, and after resting awhile, still complained of pain in right side of chest, right elbow, right hand and right ankle. Later in the afternoon he reported to a physician, who took x-rays of the injured parts and strapped his chest.

On November 28, 1934, he was referred to us for examination and treatment.

Examination: He had difficulty in raising the right arm above the level of the shoulder, and in doing this he twisted and contorted his body. With assistance, he was able to bring the arm above shoulder level. He resisted manipulation of the shoulder-joint, which produced marked voluntary spasm. There was no restriction in mobility of the elbow or wrist. Grasping power of the right hand was slightly weakened, and on internal and external rotation of the forearm patient complained of pain. There was no atrophy or dys-

function of muscles, as ascertained after tests for skin-and-muscle sensitiveness. There was an absence of sensation in the skin, as determined by pricking with a sharp instrument.

X-rays were entirely negative for fracture, dislocation, or neoplasm or osteoarthritis of the bones entering into the joint formation.

This claimant was treated by us with diathermy, infra-red, and massage of the right shoulder, arm, elbow, forearm and wrist.

The findings of a neurological consultation were as follows:

"The objective findings pertaining to the right shoulder and right upper extremity in the light of perfect musculature are normal. The apparently profound sensory disturbance cannot be explained upon an organic nervous disease basis. It is quite possible that he suffered an injury here, followed by infection implicating a few peripheral nerve fibers."

Claimant was finally sent to a hospital, where an attempt was made to cause complete mobilization of the arm under general anesthesia, but without much success. He was observed for two weeks for possibilities of malingering or hysteria, without any definite conclusions being reached. He was discharged a year and a half after commencement of treatment. At that time he was able to raise his arm about two inches above the level of the shoulder, and pain was slightly diminished.

Is this a case of hysteria, malingering, or traumatic neurosis?

THE insurance companies can be saved enormous sums of money, and the disabled patient can be returned to work at an early period, if the attending physician and his assistants will temper the treatment of the patient with human understanding, foresight and kindliness. Frequently a traumatic neurosis or malingering may be brought about as a reaction to unsympathetic handling. If the injured person is shown the advisability of the early use and function of his disabled parts, the benefit in the end will be far-reaching. Sometimes less emphasis should be placed upon the injury itself, in so far as its mention to the patient is concerned. On the other hand, sincere interest should be displayed in the human being as a whole.

Often the early settlement in the Court of Arbitration, in the case of a very severe injury, will save hundreds of dollars for the assured, and will at the same time tend to minimize the neurological or psychic disturbances which may be expected to result from a long-drawn-out and tedious treatment.

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The Estimation of Disabilities

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AT THE present time, every physician in active practice is called upon frequently, almost daily, to examine and treat patients who have been injured in industrial occupations; the majority of injuries occurring under such circumstances coming directly within the scope of workmen's compensation legislation.*

Many injuries, while severe, cause only temporary disability. That is to say, when healing has taken place, the cure is complete, and the workman so far as he or any one else is able to discover, and so far as his working capacity goes, is as good as he was previous to his injury. The time required to effect the cure may vary from a few days to several months or even longer; disability may be very slight or only partial, or it may be complete while it lasts; regardless of all of this, the essential feature of such disability is that it is *temporary*. In all such cases, after the treatment has been successful, the only question remaining for the surgeon to decide is, as to the length of the period of disability; in other words, upon what date did the healing period end, and when was full functional capacity re-established? This period of time determines the amount of compensation, which, in these cases, indemnifies only for the time lost from work. As a rule, the answer to this question is fairly readily given.

When, however, as is unfortunately often the case, the injury, owing to its nature, determines a *permanent* disability, or reduction in functional capacity, the problem confronting the surgeon is not so simple. This disability may be complete or partial; in the latter case, it becomes the duty of the surgeon to estimate the degree. While it is true that most of the states' compensation acts contain specific schedules of indemnities for certain definite injuries, such as amputation, etc., it is obviously impossible that these could cover the whole field. It is also true that frequently these specific schedules represent mere arbitrary values which have been assigned to certain specified disabilities; such values may or may not express a true estimate. Be that as it may, we are not here concerned with definite, specific disabilities or mutilations for which definite indemnities are provided by law. But it is apparent that the range of possible disabilities is entirely too great, too many unknown factors enter into the healing of wounds, each patient is a new individual in his reaction to injury, for any law to be made which could assign a specific indemnity to every injury. Hence, every case not covered by a specific indemnity by law, must be examined carefully, and an evaluation of the existing permanent disability made as a result of such examination.

Disability, or loss of function, may be viewed under several different aspects. In the first place,

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we may have an *anatomical* disability. In these cases there is an actual loss of some portion of the organism, as in an amputation of a leg. The disability may be *functional*: that is, although the disabled part has not been removed, and still forms an integral part of the organism, it is wholly or partially useless. As examples of this may be mentioned an extremity paralyzed as a result of a fracture of the spine, or severance of a peripheral nerve, vicious union in a fracture, etc. Finally, the disability may be *professional;* in the latter case, the injured man may be completely unable to perform the work which he did previous to his accident, and yet be entirely capable of doing something else.

The degree of functional impairment or disability is expressed in percentage. Under the laws of most European countries, the normal healthy organism as a whole is considered as representing 100; estimations as to the degree of impairment resulting from the loss of several fingers, a hand, vicious union in a fracture, etc., are made with this as a standard. Under most of our state laws, however, specific values are assigned to the various parts of the extremities, which lead to evaluation frequently upon a different basis. For example, a claimant may present himself with a stiff, almost useless, wrist, the result of a fracture at the lower end of the radius. The arm above the elbow is entirely normal. Under many of our laws, the arm from the elbow down would represent 100, and the estimate of functional loss would be made upon this basis. Naturally, however, many conditions arise in which the functional capacity of the body as a whole must be taken as the standard.

In Wisconsin, and in many other states, the ultimate determination of the degree of permanent disability following an injury is made by the Industrial Commission. To aid it in making this determination, the Commission receives the opinions of attending and examining physicians, who thus become very important factors in the proper administration of the law. For this reason, if his estimates are to be made intelligently, and are to be of any value, a knowledge of certain provisions of the Compensation Act is absolutely essential to any doctor who does much or little industrial surgery. It should be distinctly understood that there is here no slightest implication that the physician should concern himself in any degree with the *amount* of compensation, either in number of weeks or in dollars and cents. To be so concerned is fatal to good judgment and impartial opinion, and aside from this, it is a matter entirely for the Commission. The physician's only task is to determine the percentage of functional impairment of the injured man. However, certain schedules have been established by the law and by the Industrial Commission of Wisconsin, and every physician should be familiar with these.

IN THE first place, in the eyes of this law, under ordinary circumstances, the right arm is of no more value than the left. Also, to use an oft-cited example, the index finger of a left hand of a highly trained violinist is worth no more from a compensation standpoint than is the index finger of the left hand of a man who digs in a ditch. In other words, the Wisconsin law deals only with *functional* disability. That is to say, with the disability of a finger as a finger, or an arm as an arm, etc., and not what is the disability of a highly trained and specialized finger or arm. Next, an individual may have a permanent disability which has to be reckoned in terms of the whole man, as may occur, for example, following a severe fracture of the spine. Or the disability is such that it can be estimated in terms of all or part of an extremity. For these cases, there are provided major and minor permanent partial disability schedules, in which definite disabilities are provided for definite injuries; and finally, there is provided a table giving relative major permanent disabilities, percentage of loss of use as compared with amputation at involved joint. With all of these schedules and tables, the physician should be familiar.

To estimate the degree of permanent disability requires a thorough examination, sound judgment, experience, and common sense. The examiner must preserve a thoroughly judicial attitude. Previous to the advent of compensation legislation, which is a matter of comparatively recent years, surgeons were rarely called upon to express an opinion in exact figures as to the degree of disability in any given case; today it is a matter of daily occurrence. In the beginning, with no previous experience to serve as a guide, these opinions often represented mere guesses; today, however, by taking into consideration the factors which have been found to be important, and by considering a case in all its aspects, an examiner can arrive at a figure which seems to be approximately correct for practical purposes; that such is the case, is demonstrated by the fact that any number of independent, experienced examiners, in reference to a given case, will arrive at very nearly the same figure, with but slight variation one way or the other.

If the estimation of disabilities following injuries could be reduced to a strictly mathematical basis, the problem would be comparatively simple. Several attempts have been made with this object in view, but they all leave much to be desired.

Moorhead suggested a standard of end results based on the three factors of function, union, and contour. To function, he arbitrarily assigned a value of 60%, to union or healing, a value of 20%, and to contour or cosmetic result a value of 20%. Several objections may be urged against this method. The principal one is, however, that the most important element in the above formula, function, which must be known before the formula can be applied, is the one which we are most interested in determining. And function cannot be determined without taking into consideration union, or healing, which forms the second factor in the formula. Consequently we are just as far from a mathematical basis as ever, for the estimation of function still remains a matter of personal judgment and experience, even if we wish to make use of this suggested plan. Even this were not true,

the objection still remains that the value assigned to contour, or cosmetic result, is altogether too high.

The method of Kessler makes use of factors which are capable of measurement with some degree of accuracy, it is true. These factors are: (1) joint movement; (2) muscular power; and (3) coordination and brain control. But having obtained these measurements, the problem of applying them so as to determine correctly the loss of function in a limb as a whole still remains. By assigning certain arbitrary values to the various joints and parts of an extremity, a definite figure may be obtained, but again the personal factor has entered, and the results are no more accurate than those obtained by a simple estimation based upon careful consideration of all those factors present which go to make up the disability. In fact, in certain cases, the figures arrived at by Kessler's method will be entirely too high, judged by our Wisconsin act. Certain other reasonable objections to it may also be advanced, but a full discussion of the method does not come within the scope of this paper. Various other methods have been advanced, all of which are open to similar objections.

So far as I know, no method has been devised up to the present time into which the personal element does not enter. Consequently, none of them gives figures of which one can be absolutely sure in the last analysis. Under such circumstances, an opinion based upon thorough examination, good judgment, common sense, and experience, is just as valuable as one based upon the application of any arbitrary formula.

In any given case, the question to be decided is: To what extent if any has the functional or working capacity of the limb or individual been impaired as a result of the injury? To answer this, the examination must be conducted with a view to obtaining all the information possible upon the following points: (1) the condition of the injury itself; (2) the condition of neighboring and adjacent structures; (3) the effect of each of these upon the other; (4) the effects of all these above factors, taken collectively, upon the functional efficiency of the member as a whole or upon the individual as a whole.

The fourth point cannot be too strongly emphasized. There may be multiple disabilities, but each one cannot be estimated separately; what is desired is the functional disability of the limb, or portion of a limb, taken as a whole, and not the various disabilities of its muscles, nerves, tendons, etc., though naturally these have been considered before arriving at the final estimate.

Another factor, that of adaptation, undoubtedly plays an extremely important part in reducing the ultimate disability from any injury, no matter what. Compensation laws, as a rule do not and cannot take it into account; consequently, it cannot be considered as a definite factor in estimating disability. Its influence is extremely uncertain and hard to evaluate, since the power of adaptation varies greatly in different individuals; however, there is absolutely no doubt that were it reckoned with, our present estimates would be found to be too high.

ESTIMATES of disability rest chiefly upon those more or less definite, tangible, and principally physical conditions associated with injury, the effects of which on the ultimate functional capacity of the part, are susceptible of measurement or estimation within an approximate degree of accuracy. In other words, in estimating disabilities, the objective evidence is of the first importance. Other factors are undoubtedly present to some extent in every case, and influence the ultimate result, but their effect varies so much in each individual, and are in general so intangible, that as a rule, they must be disregarded in estimating disability. A few examples make this clear.

The attitude of the patient plays an undeniable role in his complete recovery. I am not here referring to cases of simulation or malingering, or to the traumatic neuroses. But some cases seem to lack confidence in themselves and are unable to make a proper effort to recover function, even when the physical impairment is relatively slight, and this is true where no compensation is expected.

Another factor is the personal coefficient of skill. We not infrequently see patients who have regained functional use of a member to a surprising degree, in spite of what is apparently an extremely grave physical handicap; on the other hand, patients are seen in whom the return of function is far from being what we should expect, and this in spite of their best efforts.

Closely related to the factor last mentioned is that of adaptation, or accommodation of the individual to the changed conditions following his injury, which was mentioned above. This undoubtedly plays a large role in every case; nevertheless the degree to which it will bring about improvement cannot be anticipated or estimated.

The age of the claimant is also of importance. Recovery from injuries in those past middle life is undoubtedly slower and less complete as a rule, but even this is subject to individual variation.

In all cases, it must be clear that no opinion can be based on anatomical findings alone. While in general, anatomical and functional results are usually closely interdependent, yet this does not hold true in every case, and it is upon the basis of functional efficiency that we must base our estimate. In all cases, we cannot confine our examination to the injury alone, and base our opinion upon its condition; the condition of all the parts of the affected member must be taken into consideration. If the lesions are multiple, also, we cannot evaluate them separately, assigning certain percentage to a fracture, another percentage to loss of motion in a joint, etc. The sum of figures obtained in this way does not represent the actual disability present, but it is not infrequent to see an attempt made to arrive at it in this way. In every case, the estimate is to be made of the loss of function of the limb as a whole, and not upon that of its various parts.

Bone Graft in Non-Union of Fractures

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THE normal healing processes in the repair of a fracture of a bone require an average length of time for solid union. If this period is extended the fracture is called one of delayed union. However, should complete and firm healing fail to occur, the condition is termed that of non-union. The transition from normal to delayed healing and from delayed healing to non-union is never definite, being based largely upon the time element.

If after a reasonable length of time—four to six months—the fracture line is tender, the soft parts slightly edematous, false motion present and weight bearing is a source of pain, one may assume that the healing of the fracture has not occurred and that non-union exists.

In order that one may have some understanding of the causes of non-united fractures and of their treatment, a knowledge of the physiological steps in the repair of bone is essential. However, in attempting to gain this knowledge one is confronted with a mass of contradictions in the experimental and laboratory work and in the clinical course of events. Many of the problems of healing and disease of bone are unsolved.

What is the sequence of events in the repair of a fracture? What is the part played by the periosteum, by the cortex, and by the medullary bone in this reparative process? Does the calcium deposited in the formation of callus have its origin in the blood serum or is it derived from the local tissues? Or is it brought from the distal fragment by the lymph channels (Cohn's theory)? What is the relation of the nervous system to, and what is the influence of pain in, the healing of a fracture? If there any influence exerted by the endocrines, especially the parathyroid hormone? Why is non-union relatively so frequent in certain areas of long bones, as the lower portion of the tibia, humerus, and the bones of the forearm? What are the factors to influence to a varied degree the healing at different levels in the same bone, making the intertrochanteric fracture of the femur one of a most favorable prognosis and, on the other hand, the intracapsular fracture, only a few inches proximal, one of grave prognosis for healing? What is the part played by the enzyme phosphatase, and why is there an increase of the acidity of the blood serum at the fracture line? Why is fixation so essential in fractures of the human skeleton and apparently so non-essential in fractures of the lower animal? Is the blood supply derived from the adjacent tissues more important than that from the bone itself? Why do absorption and non-union occur so frequently in compression fractures of the red marrow bones in which immobilization has not been efficient for a long period? Why in the ball and socket type of non-union is the socket always on the proximal fragment? Do multiple fractures heal more slowly than a single fracture? Questions for dispute and for argument—questions to confuse the problem of the non-united fracture and to multiply the plans of treatment.

Healing of Fractures

THE most acceptable explanation of the phenomenon of the healing of a fractured bone and the sequence of the changes which take place may be stated as follows:

First, there is an outpouring of blood from the ends of the bone and from the lacerated soft tissues. This hemorrhage is not absorbed quickly but forms a blood clot which is invaded by osteofibroblasts. These cells deposit an osteoid material or preosseous substance which contains some cartilage and is called the granulation tissue. In this granulation tissue is deposited calcium which eventually assumes a solid consistency simulating bone tissue. The callus which is thus formed may be in excess of that needed for complete repair and a part of this excess may be absorbed.

In this process it will be noted that the first step is an increase of blood about the ends of the bones. This blood serum has a higher acid reaction than normal bone but the reason for this is not clearly understood. In the end of each fragment there takes place a decalcification or osteoporosis which may be due to the increase of blood in this area, as it has been shown that the calcium salts are removed in any bone area in which the circulation is increased. As the blood clot becomes organized into the granulation and fibrous tissue. the blood supply is diminished and the calcium reappears. At this point the picture becomes somewhat confusing. One group of investigators states that from some special embryonic cell or from the surrounding connective tissue comes a special bone forming cell, the osteoblast, which invades the granulation tissue and is an important factor in the deposition of the calcium and in the formation of the bone tissue. Another group questions this cellular activity and considers that some unknown stimulus (the enzyme phosphatase) induces the calcification, the calcium being obtained locally rather than from the blood serum. A third group considers the possibility of the cellular activity of the osteoclast (bone forming) and later the chemical action of some enzyme by which the excessive bone is absorbed (osteolysis).

Key states that we are ignorant as to two salient points in the healing process of bone: (1) The mechanism by which calcium is deposited in the granulation or pre-osseous tissue, and (2) the immediate stimulus which leads to bone formation in any given location. Murray, in his experimental work, showed that bone would form in any tissue in which there was death of tissue, formation of granulation tissue, a concentration of calcium and a proper pH of the tissue fluid.

Bone tissue, like all tissue of mesoblastic origin, has a great power of repair, but just which of the elements composing bone take part in this repair is not clearly understood.

The medullary cavity which is rich in blood supply is quickly closed by the intramedullary plug consisting of a soft reticular tissue. This plug eventually becomes changed into bone tissue and in the final process of healing of the fracture obliterates the medullary canal.

The cortical portion of the bone apparently plays a passive role. The space between the cortical rims is filled with granulation tissue which unites with that of the medullary space and that on the outer side of the bone.

The reaction of the periosteum in the bone healing is also a subject of dispute. In many fractures the periosteum is badly lacerated and in the operative procedure may be sacrificed about the fracture line. In bone grafts the periosteum may be and usually is completely absent. Cubbins considers the cells between the cortex and the periosteum most important and calls attention to the loose attachment of the periosteum in children and to the vigorous rapid healing of bone in this age.

Murray states that 60% of the healing factors come from the muscle and fascial planes and 40% from the "soft parts" of the bone (endosteum, periosteum and aveolar tissue about the blood vessels).

Endocrines

CONSIDERABLE experimental work has been done to show the relationship between the internal secretions of the body and the growth of bone and also bone diseases. Kolodny, in a study of the effects of the endocrines in non-union, concluded that the normal testicular secretion is essential for the healing of fractures in animals before maturity but not in adults; that in a pancreatectomized dog the formation of callus was markedly postponed, and that the normal thyroid function was absolutely essential for the healing of fractures.

The parathyroid hormone has been the subject of much study in bone conditions. But here again one finds indefinite and confusing conclusions. The calcium and the phosphorus content of the blood serum has a definite relationship and it is more or less accepted that any increase in the blood calcium is at the expense of the bone calcium. There is also a definite influence of the parathyroid hormone and the vitamin D in the maintenance of the calcium-phosphorus blood index. Vitamin D is probably the antagonist of the parathyroid hormone. In generalized bone demineralization an attempt has been made to show a direct relation to hyperparathyroidism but this is not true as many cases of decalcification have a normal blood picture. The only bone entity definitely associated with parathyroid disease is osteitis fibrosa cystica. It has never been proved that the parathyroid hormone influences in any way the healing of a fracture.

Causes of Non-Union

THE factors which cause non-union of fractured bones may be classified as: (1) constitutional, (2) local, and (3) extraneous.

CONSTITUTIONAL: That some congenital defect is present in the bone or in those physiological factors which make a normal healing of bone may explain the uncommon fractures, usually in the tibia, in infants and young children which only too often resist all types of treatment and result in non-union.

Some constitutional diseases, syphilis and diabetes, have long been considered as factors in non-union but most authorities now have the opinion that these diseases have no part in influencing the healing of bone. I have seen but one fracture case in which syphilis might have been a factor in the non-union. On the other hand, many syphilitics have had normal healing of the fracture and many have had bone operations without any sequelae due to this disease.

LOCAL: Interposition of soft tissue is only too often given as the cause of a non-union but the writer feels that this condition is rare and that many operators have interpreted the fibrous tissue of the healing process as some soft tissue from the surrounding parts. It is possible, however, that a portion of the muscle may be caught by the sharp bone fragment and pulled between the fragments or that the end of the bone may penetrate the muscle belly. In one case a large flap of the capsule of the hip joint was found between the fragments and in that particular instance was considered as the cause of the non-union.

Malposition is a factor only when the adjacent surfaces of the overriding fragments are covered with periosteum. Cubbins found that union will take place between two cortical surfaces denuded of periosteum more slowly if one cortical surface is covered with periosteum and no union if both bones are covered with periosteum.

The writer is of the opinion that a slight displacement of the fragments leads to a more rapid healing than when an accurate reposition of the fragments has been obtained. Key and Cubbins have also made this same observation.

Separation of the fragments is one of the more frequent causes of non-union, especially in the humerus where the muscle arrangement is such that a very slight traction may produce a separation. In the tibia and the femur it is easy to have too much skeletal traction exerted through the Steinman pin or the Kirschner wire and the powerful pull of the fracture table. The closer the contact of the fragments, the better the prognosis for healing. Impacted fractures rarely fail to unite.

Defective or impaired circulation is without doubt a cause for non-union and an important factor in the disturbance of the formation of a normal pre-osseous fibrous tissue which is so essential to the bone repair. It is questionable if the injury to the nutrient artery is of great importance but that the lack of a free blood supply in the surrounding tissues is the essential factor. May one explain the frequency of non-union in the distal portions of the humerus, radius and ulna, and the tibia as being due in part to the fact that this portion of the bones is surrounded largely by tendons or is covered with only skin and thus lacks the vascular surroundings of the

proximal portion which is largely that of muscles rich in blood?

In compound fractures healing may be delayed. Infection per se does not imply non-union but non-union is a more common occurrence in infected fractures than in simple or uninfected compound fractures. Comminution does not delay healing but may, in the opinion of some surgeons, hasten the repair through the presence of a larger amount of available local calcium in the comminution. The open reduction of a simple fracture usually results in a longer period for healing.

The majority of non-unions occur in apparently healthy robust individuals in the prime of life. Non-union is uncommon in children and in the aged. Healing of bone in osteomalacia, fragilitas ossiu, Paget's disease, and often in malignancy is a frequent occurrence.

Extraneous: Under this group may be placed as causes for non-union inadequate fixation, frequent manipulations, metal used for fixation and nerve injuries. Inadequate fixation by the use of inefficient splints is perhaps one of the most frequent causes for non-union. If the splint does not prevent motion in the line of fracture there occurs a definite retarding influence in the normal healing process in which the pre-osseous fibrous tissues fail to become transformed into bone tissue or firm callus. Heavily padded splints, splints which are not extensive enough to incorporate the joints distal and proximal to the fracture are examples of this type of inefficient splintage.

Frequent changing of the splints in order to give massage or to test for union again offers a disturbance in the healing process. In the healing of any wound rest has long been recognized as a most important fact and this is especially true in the repair of a fracture of the bone.

The relation of foreign material to any disturbance in bone healing is a question of dispute. The writer is of the opinion that the foreign material, —metal plates, wires or bands,—is not in itself a cause of non-union. These devices have been used extensively with excellent results, but should be removed as soon as they have served their purpose of holding the fragments in position until some union has occurred. The ill effect of metal in contact with the bone is due to the fact that many surgeons consider these devices as means of fixation of the fracture and not as sutures and, therefore, do not use an efficient external splint. As a result of the poor splintage, motion occurs in the line of fracture with a strain and stress upon the metal device leading to necrosis about the metal. The metal then becomes an irritating foreign body and interferes with the normal healing process with non-union as the end result. Venable and Stuck suggest that electrolysis generated by certain metals used in bone surgery causes non-union.

The relation of nerve influences to the healing of fractures is not known. Turner has brought out the thought that the painful irritation of the fracture line is a large factor in the demineralization of bones. As the muscle contraction is caused by the stimulation of an acid (acetylcholine) liberated at the junction of the nerve terminal with the muscle fiber, so it may be possible that the stimulation of the sensory (pain) nerves at the fracture line through movements in that region may produce or liberate a similar substance which has a retarding effect upon the healing of bone and which may cause the absorption of the calcium from the fragments, producing osteoporosis. Why this decalcification is more extensive in the bones distal to the fracture line is not explained except by Cohn's theory. Acetylcholine is a substance which causes a dilatation of the capillaries and small vessels. It may be that the substance liberated in the bone has a similar action and through this increase of blood supply in the bone, demineralization or osteoporosis occurs.

Diagnosis of Non-Union

AS ALL non-union is preceded by delayed union and as it is difficult to determine when the latter ends and the former begins, the diagnosis of non-union must rest largely upon the judgment of the surgeon. It might be stated that if healing is not complete within six months from the time of the fracture that non-union exists.

Non-union may be classified into three types:

1. The fibrous union may be only a thin plate between the fragments or even between a portion of fragments. The x-ray shows but little, if any, callus formation and the fracture line is represented by a well defined dark line in the negative. Clinically, these fractures may show but little or no false motion and the patient is able to bear full weight. There is, however, pain and aching in the fracture line and the soft parts are edematous and often red.

2. The fibrous union shows as a wide plate, false motion is easily obtained and weight bearing is not possible or is very painful. In these cases there is, as a rule, considerable displacement or separation of the fragments.

3. In some cases of long standing one may find an attempt to form a ball and socket joint in the fracture line, the socket always being in the proximal fragment. False motion is well defined and weight bearing difficult. This type of non-union occurs more frequently in the upper extremity, especially in the radius and ulna where the rotation of the forearm may be a factor.

Treatment

IN NON-UNION there exists in and about the fracture line a condition in which the normal reaction of the tissues to repair has ceased and unless some stimulus is given to the tissues to excite again this reparative power the condition of non-union persists for an indefinite time. With the advent of the bone graft into the field of bone surgery the many previous methods were discarded and the bone graft has been almost universally used for non-union. A discussion of the fate of the autogenous bone graft and the manner in which it plays its part in bone repair leads one into a wide field of speculations, theories and ex-

Fig. 1. Fig. 2. Fig. 3.

Fig. 1: Compound oblique fracture of tibia — wound infected. Fig. 2: Compound oblique fracture of tibia (same as Fig. 1) showing step operation. Excellent result as to union and as to function in ankle. Fig. 3: Sliding graft — tibia

perimental conclusions. It may be stated, however, that the autogenous bone graft is the most successful stimulus in non-union, that the larger and more massive the graft the better the result and that it is not essential that the graft retain its periosteal covering.

That the graft does not need to be a living tissue has been proved. Speed cites an instance in which a living graft which had been dropped on the floor, was boiled and then used. Its reaction was similar to that of a living bone in the repair of the fracture. Does the graft act as a scaffold through or across which new bone is formed or does it bring into the field a larger amount of calcium? The x-ray may show complete disappearance of the graft or no change whatsoever in its size or density. In second operations the graft may be seen firmly embedded in the host and distinguished from the normal bone only by a somewhat whiter color and a greater hardness.

In the first group, those in which there is only a thin fibrous plate and the clinical diagnosis of non-union is uncertain, the healing process may be stimulated by increasing and restoring the circulation in the line of fracture by drilling multiple holes in the ends of the fragments without disturbing the granulation tissue. One may supplement this drilling by throwing across the fracture line a sliding inlay graft or osteoperiosteal strips. As a rule, if the healing is to occur it takes place rapidly.

In the third group, in which a ball and socket joint has formed and eburnation of the ends of the bone is well advanced, it becomes necessary to excise the false joint and thus sacrifice a material portion of the shaft of the bone. In order to compensate for this loss of bone substance and to bridge across the defect in the shaft, the massive onlay graft, to be described later, has been proved to be the most efficient and the most satisfactory in producing a solid union.

The second group, in which the non-union is easily determined, represents the largest percentage of non-union cases. The early plan of merely removing the granulation tissue, refreshing the ends of the bone and approximating the fragments resulted in many failures and is more or less discarded. When the fracture line is markedly oblique the fragments may be "stepped" and a large surface of raw bone be opposed (Figs.

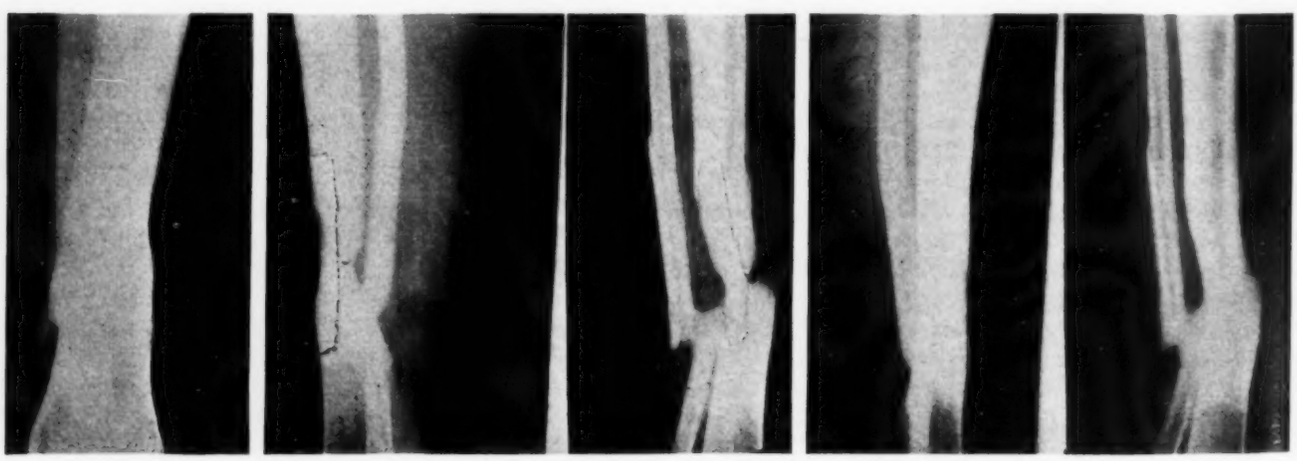

Fig. 4. Fig. 5. Fig. 6

Fig. 4: End result of sliding graft (same as Fig. 3). Fig. 5: Compound infected fracture of tibia with loss of bone continuity. Inlay graft. Fig. 6: Compound fracture of tibia (same as Fig. 5) showing end result. Excellent function without pain in the ankle

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 7: Inlay graft in ulna. Fig. 8: Onlay graft in radius. The union in the ulna healed during period of fixation required for healing of radius. Fig. 9: Multiple fracture of tibia with non-union in lower fragment

1, 2). Fixation may be increased by using autogenous or beef bone nails.

The first type of bone graft was that of a sliding or inlay graft, (Figs. 3, 4, 5, 6, 7) the graft being obtained from the fractured bone or from a normal tibia. The success of this type of operation depends largely upon an exact fit of the inlay in order to have firm contact of the graft with the host and also in so shaping the sides of the host that the graft will not fall into the medullary canal. Although this method will give a large percentage of cures, the number of failures is sufficient to advise the use of the onlay graft whenever this is feasible. The inlay graft can be supplemented with the use of osteoperiosteal strips across the fracture line.

As it became more convincing from the study of bone grafts that the greater the amount of local calcium (a larger bone graft) and the more firmly the fragments were fixed by the graft, the greater the percentage of cures Henderson, Campbell and others suggested the use of a massive piece of

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 10: Onlay graft tibia (same as Fig. 9). Fig. 11: Onlay graft tibia. Note pins "staggered." Fig. 12: Onlay graft — femur. The pins should not be parallel as shown, but "staggered" at different angles

bone to be firmly fixed to the shaft of the bone and extending across the fracture line. This is the onlay or massive bone graft. (Figs. 7, 8, 9, 10, 11, 12.) In any type of graft it is essential to fill in the space along the fracture line with bone chips or medullary bone tissue.

Operation for Onlay Graft

THE steps in the operation are those suggested by Campbell and by Henderson. The granulation tissue is removed from between the ends of the bone, the medullary cavity in each fragment is reopened by removing the medullary plugs, the eburnated bone on each fragment is cut away, if possible the ends of the fragment are so shaped as to give close contact of surfaces, although this contact can be sacrificed in order to save length.

The cortex is cut so as to give a level surface for contact with the under surface of the autogenous onlay graft. This graft, taken from the tibia, should be as wide as possible. The endosteum is removed from the graft and carefully preserved to be used as a packing along the edges of the placed graft, especially at the fracture line. This "packing" can be reinforced by obtaining further medullary bone from the tibia. The pegs or screws should extend into or through the cortex on the side of the shaft opposite to the graft and "staggered" in at different angles.

The pins or screws can be previously prepared from beef bone. The drill holes in the graft should be made at the desired points in the graft before the graft is removed. The graft is then held firmly against the shaft of the bone by means of some type of bone clamp. As each hole is drilled in the cortex the drill is left in place and a fresh drill used for each succeeding drill hole. The pins, made by a dowel of the same size as the drill point, or 1/64 in. larger, then replace the drills. During this process it is essential that the graft be firmly held against the shaft to prevent any springing out of the graft.

After the graft is placed and fixed by means of the pins or screws all available chips of healthy bone or the soft medullary (endosteal) bone tissue should be packed along the edges of the graft and if any space exists between the fragments it should be filled in with such bone tissue.

Often a rather long firm piece of endosteal bone can be obtained from the inner side of the graft, as this surface is cut flat to fit the shaft of the fractured bone. This piece of bone can be used as an intramedullary peg, extending across the fracture line. The bone graft should be so placed that there is no tension or stress upon the fixation pins. Pins or screws previously made of ivory or beef bone not only shorten the operation but are as efficient as autogenous pins made at the time of the operation. In order that these pins or screws be of the right length to be fixed in the cortex on the opposite side of the bone a small caliper may be used to determine their length.

If the nails or pins are made from autogenous bone and a dowel cutter of the right size is not available they may be rounded and shaped by means of a rasp. A metal drill scale is of assistance in obtaining the correct diameter of these pins.

If the graft has been well placed and the nails fit tightly and into the opposite cortical side, a very strong and firm fixation of the fragments will be obtained. However, it is most essential to remember that this graft is not for fixation purposes and that one must apply an external splint of the same efficiency as if the graft had not been applied. In most instances it will be found necessary to replace the original splint at the end of ten days or two weeks with one fitting more snugly to the parts. The length of time this splint is used will vary with the different bones of the skeleton. It is advisable to have a little extra healing period rather than to disturb a graft not completely united to the bone.

Resume

PAIN, edema, local tenderness with or without clinical false motion in a fracture line six months after the fracture of the bone is indicative of a non-union.

2. In those cases with some evidence of callus with mild symptoms, healing may be stimulated by multiple drilling of the ends of the fragments.

3. The choice of type of bone graft will vary with the local conditions found when the fracture line is exposed. In an oblique fracture one may obtain union by freshening the edges (step-operation) and maintaining close contact through the use of bone pegs or screws.

4. The massive onlay graft apparently gives a better prognosis than does the inlay graft.

5. In using any type of bone graft it is essential that complete fixation by means of some external splintage be maintained throughout the entire period required for healing.

Central States Society

—Abstracts of Papers given at the Annual Mid-Winter Clinical Meeting, Milwaukee, Wisconsin, December 9, 1938—

THE Annual Mid-Winter Clinical Meeting of the Central States Society of Industrial Medicine and Surgery was held at the Pfister Hotel, Milwaukee, Friday, December 9, 1938, with the following program:

MORNING SESSION:

"Surgical Problems Involving the Os Calcis," by EDWARD QUICK, M.D., Milwaukee.

"Traumatic Abdomen," by S. H. WETZLER, M.D., Milwaukee.

"Infections of the Hand," by J. B. MATTHEWS, M.D., Milwaukee.

"Industrial Examinations," by A. W. GRAY, M.D., Milwaukee.

"Silicosis and Silico-Tuberculosis," by O. A SANDER, M.D., Milwaukee.

AFTERNOON SESSION:

"Address," WILLIAM C. GOENNE, M.D., President, Davenport, Iowa.

"Estimating Disabilities," by Ralph M. Carter, M.D., Green Bay. (Discussion, A. J. Weber, M.D., Milwaukee).

"Common Errors in Treating Fractures," by Kellogg Speed, M.D., Chicago.

"Back Injuries and Their Treatment," by Merritt L. Jones, M.D., Wausau.

"Injection Treatment of Hernia," by Arnold Jackson, M.D., Madison. (Discussion, Frederick W. Slobe, M.D., Chicago).

The evening session was a dinner meeting held at 6:30, with Dr. William C. Goenne, President, presiding; and the guest speaker Dr. Harry E. Mock, of Chicago, who spoke on "Diagnosis and Indications for Surgery in Head Injuries."

Morning Session

DR. EDWARD QUICK, discussing "Surgical Problems Involving the Os Calcis," said he would limit his consideration to a discussion of fractures of the os calcis, which constitute 1% to 2% of all fractures. Such an injury is usually sustained by a fall from a height and is readily diagnosable if one searches for the condition. Ordinarily there are two techniques for producing traction, that devised by Böhler of Vienna, in which the bone is pierced with a Steinmann pin, the pin being put through the tibia for the purpose of traction; an important part of the technique is the molding of the fractured bone into proper position. The other technique is the so-called Cotton method which has been used a great deal by Wilson and consists of the same principle but eliminates transfixion — the objection being that approximately 10% of the fractures become compound because of the transfixion technique. There were a number of x-ray films showing the lines representing the tuber angle and also the salient angle. An axial film is very important, to show the foot in extreme dorsal flexion. A demonstration of the technique of traction was given by Dr. Ulrich Senn. Diagnosis and pathology must be well established by x-ray films including lateral and dorsal plantar as well as axial. The Cotton method is found satisfactory. The patient is treated under full anesthesia, the heel being molded over an orthopedic block; a clamp is applied to compress the widened portion of the bone, used over felt pads, and comparing the injured heel with the uninjured one. A pull is made on the anterior portion of the heel; the cast is applied up to the middle of the tibia and well molded on the heel in marked inversion, with the heel flexed. The cast is left on for about six weeks, then removed and a Thomas heel shoe applied. If there is much comminution in the subastragular joint, the disability can be reduced from approximately 25 to 5% by doing an arthrodesis, which should be done fairly early, not later than five to six weeks after the injury. The cast is applied in a position of inversion for four to five weeks and no weight-bearing is allowed for eight weeks.

DR. S. H. WETZLER, on the subject of "Traumatic Abdomen," stated that he would limit his consideration to wounds of surgical importance only. Injuries can involve the abdominal wall, the subcutaneous tissues and the viscera. The degree of damage is often not evident without exploratory operation. Experience with a case of ruptured femoral artery was mentioned. The absence of gas bubbles in the x-ray is not a guarantee of the absence of perforation of the small intestine. Rigidity and tenderness are important findings. Injuries to soft parts are often complicated by fractures. Shock, pain and signs of hemorrhage are important criteria for operation; each hour after the sixth increases mortality until the twelfth hour, after which the mortality goes to 80% and beyond. The differentiation between shock and hemorrhage symptoms is difficult. Of course operation in shock is questionable, but the patient may never come out of the shock. Thorough exploration is very important. Most cases of retroperitoneal hemorrhage do not benefit by operation because of the difficulty of locating the hemorrhage. Spinal anesthesia is preferred by the essayist, 50 mgm. of novocain being used. Vital points are early diagnosis and prompt operation. A series of case reports were then given, and Dr. Wetzler concluded with remarks on traumatic appendicitis, pointing out the importance of the following postulates: (1) absolute freedom from abdominal complications, such as nausea and tenderness before the injury; (2) history of direct trauma to the right half of the abdomen; (3) the happening of an unexpected event; and (4) symptoms must occur immediately after the injury and must be persistent and progressive—it is particularly important that the pain should be prompt, persistent and progressive.*

Dr. John Ellis, in discussion, said that an increase in the white blood cells up to 20,000 to 30,000 means a ruptured viscus. Sedimentation rate rises to 20 to 25 in 30 minutes by the Cutler method. The icterus index is important and goes up to 10 to 12, 24 hours after the injury. The use of a hematocrit may give some differential information as between shock and hemorrhage.

DR. J. B. MATTHEWS spoke on "Infections of the Hand." The important point about abrasions and lacerations is the prevention of infection. Lacerated tendons should be sutured in four hours or secondary repair done. Slings and splints have been found very useful in treatment. Fractures are second in frequency in such injuries and the x-ray is very important in the diagnosis; fractures of the scaphoid should be given special attention. Other wounds are amputations, burns and puncture wounds. The x-ray is an important adjunct in the diagnosis of suspected foreign bodies, as far as the record is concerned, but one should be conservative as to the removal of such bodies. The midpalmar fascial space is most important in infection. Symptoms of acute tenosynovitis were given as follows: (1) extreme tenderness over the sheath; (2) symmetrical enlargement of entire finger; (3) severe pain on extension of finger; and (4) finger carried in partial flexion. A discussion

* Dr. Wetzler's article was published in full in Industrial Medicine for January, 1939.

of the various elements in differentiating bursitis was also given. The operative procedure for tenosynovitis was outlined and postoperative treatment considered. It should be borne in mind that tenosynovitis and radio-ulnar bursitis are emergencies. It is important likewise to remember that tenosynovitis and bursitis are more liable to produce functional disability than infection in fascial spaces. The neglected case is indeed a real problem. The important points in conclusion were: (1) early and adequate attention to the reduction of disability; (2) early differential diagnosis; (3) early wide incision under general anesthesia.

Dr. Arnold Jackson, in discussion, believed that in many cases of traumatic abdomen, operation should be done after two hours even if no diagnosis has been made. The use of spinal anesthesia is more favorable in the presence of shock; catheterizations of persons with pelvic injuries should be done promptly. Sulphanilimide may be used in acute infections.

Dr. A. W. GRAY spoke on "Industrial Examinations." A plea was made for better, more complete industrial examinations. Physicians should cooperate for better industrial health. Medical help and advice will always be necessary to engineers and managers. Pre-employment examinations are often adequate in large groups, but the same cannot be said in smaller organizations. Examinations are not often used, as they should be, for health promotion and followed by periodic examinations. Reference was made to a meeting held in Milwaukee last spring with the industrial commission and various industrial representatives in regard to examinations; an attempt will be made to reach the small groups. It is an important point that the physician should understand the hazards and the working conditions of employees. Problems arise eventually in the proper education of management and workers to the importance of pre-employment and periodic examinations.

Dr. John N. Holcomb, in discussion, stated that the responsibility rests with medical men, that examinations must benefit the employee, and that one must avoid the eliminative examination.

Dr. O. A. SANDER, in speaking of "Silicosis and Silico-Tuberculosis," centered his remarks around a case demonstration of x-ray films of the chest, showing various characteristic lesions. The first two cases demonstrated were contrasted—one, a young man of 23, who had had no dust inhalation but who had sinusitis and bronchitis: the x-ray film showed a considerable increase in the extent and density of the hilum and trunk shadows; the other being a molder who had had dust exposure for 25 years, whose film showed less increase of the hilum and trunk shadows than the boy of 23 who had had a sinusitis and bronchitis. Similarly, in a man of 50 who had been a molder for 20 years there was a moderate increase in the hilum and trunk shadows as to extent and density; contrasted was a boy of 26 with a similar appearance of moderately increased hilum and trunk structures along with emphysematous blebs scattered throughout both lungs—a case of congenital cystic lung proved by later postmortem. In a sand chipper of 59, distinct nodulation showed no change in a five-year interval; in a contrast case, a man of 38 with a similar distinct nodulation whose only dust exposure was to electric welding fumes in tank work—one case similar to this at postmortem showed iron deposits in the lymphatics with no fibrous tissue. A man of 41 who had ground cutlery on wet sandstone wheels for 14 years showed a large nodular silicosis with evidence of enlargement of the nodules during four years of observation; the contrast case was a man of 36 with a number of years' exposure to quartz which had not been sufficient to produce silicosis, but both lungs showed large nodes which had the appearance of metastatic carcinoma. Another case was a foundry worker with increased linear pattern in 1933, which showed gradually increasing fibrosis and emphysema during the next five years and now is a typical asbestosis with definite dyspnea on mild exertion. History reveals intense exposure to asbestos dust 15 years ago for a two-year period. In a man of 60 who had been a sand chipper for 35 years, there was no visible increase in the nodular silicosis in a five-year period; the nodular fibrosis is discrete and not excessive considering the length and intensity of exposure and there are no symptoms referable to the lungs. A sandblaster of 55 years of age who had had massive unprotected exposure for four years up to 14 years ago has a large conglomerate nodular silicosis showing increasing conglomeration and emphysema in past five years of non-dusty work; may be infected, but no clinical evidence of tuberculosis; has definite dyspnea on slight exertion. Cardinal points emphasized with the demonstration of the non-infected cases were: (1) need of careful, detailed and complete occupational histories before evaluating any roentgenological appearances; (2) caution against jumping at conclusions without careful analysis of all factors; (3) lack of chest symptoms with discrete nodulation and gradual onset of symptoms as nodulation becomes conglomerate; (4) absence of visible progression in five-year interval with moderate prolonged exposures and visible progression only where exposures were massive and of short duration. This non-infected series was followed by five-year serial film studies on seven cases of silico-tuberculosis. The chief points emphasized by these seven cases were: (1) extreme chronicity of silico-tuberculosis for many years, sometimes showing slight spread of the infection shadows on serial x-ray, but no clinical or laboratory evidence of activity until terminal breakdown of the infection with its bronchogenic spread; (2) most silicotic lungs which show conglomerate shadows are true pathologically active silico-tuberculosis, even though all clinical and laboratory tests of activity are negative—this proved by the increasing numbers of these cases seen to break down late in life, at which time the sputum becomes positive for tubercle bacilli; (3) nothing gained by removing

these cases from their jobs and placing them in sanatoria during the "silent" period; (4) keeping them at work under controlled dust conditions and with frequent observations until definite spread of the infection occurs is suggested as the best solution of this complex problem; (5) very few silico-tuberculosis cases are late superimpositions of tuberculosis on previously uninfected silicotic lungs—the vast majority, undoubtedly, were infected early in life, the infection being kept localized and pathologically active by the accumulating silica. The last case was of particular interest in this connection, because in a coremaker of 52 with early uninfected silicosis observed for five years, recent new shadows in both upper lobes appeared to make this a rare case of late superimposed tuberculosis. This x-ray change was accompanied by cough, pain in the chest, night sweats, fatigue, and rapid blood sedimentation, but no rales were heard, there was no fever, and tuberculin and sputum were negative. Another film one month later showed the upper lobe shadows to have disappeared and the man has returned to work. A word of caution was given against calling all upper lobe infiltrations tuberculous, especially when they occur in the later decades of life.

Afternoon Session

PRESIDENT WILLIAM C. GOENNE emphasized the importance of the recognition of industrial surgery by various groups and cited the tremendous losses resulting from injuries. The compensation law theory and experience were reviewed. There has been a definite change in attitude by insurance companies. Industrial surgery has now come to be a factor in the preventive program in industry with reference to the prevention of accidents. We should all recognize, and so should industry, that surgical service is not a commodity. The status of the industrial surgeon has changed greatly and is still changing favorably.

DR. RALPH M. CARTER, speaking of "Estimating Disability," said that there are a number of kinds of disability: permanent, temporary, complete, and partial. Difficulties may arise in combinations of these. The laws provide schedules for indemnity but there are a number of complex factors concerned. Hence the necessity for careful examinations and estimates of disability. The estimation of functional losses may be based on the member alone or on the whole body. The physician's special job is to establish the amount of functional impairment. It happens that estimates as put into schedules do not involve the type of training of the injured member. Reference was made to Moorhead's formula for the mathematical establishment of disability, allowing 60% for function, 20% for union and 20% for contour—however, these figures will not always apply, and Kessler's method is not always helpful. It has been found that experience is as good a basis as an arbitrary formula. It is important to consider: (1) condition of the injury; (2) condition of adjacent structures; (3) the effect of these on each other; and (4) the effect on the individual as a whole. The factors which are important to consider in the estimation of disability are the attitude of the patient; the personal coefficient of skill; the adaptation of the injured; and the age of the claimant. There should be no opinion submitted on anatomical findings alone. Finally, the estimate of disability should be on the injury as a whole and not on the parts.

DR. KELLOGG SPEED spoke on "Common Errors in Treating Fractures." Most of the errors in diagnosis are due to incomplete examinations and failure to remove all the clothing; also to incomplete or poor x-ray films. Most of the errors in treatment are due to wrong selection or poor application of the method of treatment; and also to unnecessary operative treatment. A great mistake in after-care is due to lack of attention to details, bearing in mind that only the average healing time is significant. A number of x-ray lantern slides of fractures of various portions of the body were shown, including fractures of the phalanges, radius and ulna, small bones of the hand, cervical dislocations of the spinal vertebra, pelvis, os calcis, tarsal bones, navicular, elbows in children, humerus and femur.

DR. MERRITT L. JONES discussed "Back Injuries and their Treatment." In classifying causes of 1000 cases of back pain, the main divisions were (1) functional; (2) referred pain; and (3) essential pain. There were many subdivisions of these main headings, as given on an outline by Dr. Jones. Lantern slide demonstration included cases of poor posture, segmented vertebrae, disease of body of vertebra, truncated vertebra, injury to intervertebral disc, including fracture and dislocation; arthritis of the spine; tuberculosis of the spine; acute and chronic sacro-iliac cases in which differentiation lies mainly in the fact that the former is due to injury and the latter to posture or disease; congenital malformations; spondylolisthesis, and cancer of the spine.

DR. ARNOLD JACKSON gave the last paper on the program, on the subject "Injection Treatment of Hernia." According to the figures in one report of hernia operations there is an incidence of 29% recurrence, with 63% recurrence after one year. In the experience of the University of Minnesota Clinic where injection treatment is done, 457 hernias were treated with 4570 injections and one complication occurred, a slough of the omentum—this was opened and properly treated. The average cost of surgical herniotomy has been placed at $315.00, whereas the average cost of the injection treatment has been placed at $50.00. A very important factor in the success of injection treatment of hernia is the proper fitting of truss and also the fact that the truss be used for the period advised. Obese people are poor subjects for this type of treatment. One must have the cooperation of the patient in order to have satisfactory results, which are most commonly seen in younger males. The method is an ideal one for children and oldsters. Injections are usually given

about a week apart. There has been an insufficient amount of time to say whether the scars in this type of treatment are permanent. The disadvantages in this kind of treatment are the long period of time involved and discomfort of the use of the truss. A very important point is the selection of cases. It is believed that we should approach the use of the injection treatment of hernia with an open mind, and that the outcome should be favorable if the cases are properly selected and treated.

Dr. Frederick Slobe in discussion, believed in a conservative approach. He has used the treatment for five years and has had fewer cases than Dr. Jackson. Regarding statistical figures, it is believed that it is quite difficult, in fact, impossible in some instances, to separate the different types of hernia—without opening the structures as in a surgical operation. We cannot accept the patient's word for a cure—the patient must be examined. Any bulging on postoperative examination should be considered a recurrence and should either be further injected or operated upon. In conclusion, it is believed that the injection treatment of hernia is a valuable addition to the surgical methods, if properly used.

Industrial Health Congress

—Abstracts of Papers delivered at the First Annual Congress on Industrial Health of the A.M.A., Chicago, January 9-10, 1939—

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Chicago

THE First Annual Congress on Industrial Health, of the American Medical Association, was held at the Palmer House, Chicago, January 9-10, 1939, with the following program:

Monday Morning

STANLEY J. SEEGER, M.D., presiding: "Report of the Council on Industrial Health," Stanley J. Seeger, M.D., Chairman, Milwaukee.

Symposium on Industrial Relationships

"The Physician in Industry and Organized Medicine," Irvin Abell, M.D., President, American Medical Association, Louisville, Kentucky.

"The Physician in Industry and The Employer," C. D. Selby, M.D., President American Association of Industrial Physicians and Surgeons, Detroit.

"The Physician in Industry and the Employee," Loyal A. Shoudy, M.D., Chief of Medical Service, Bethlehem Steel, Bethlehem, Pennsylvania.

"Industrial Health and the Private Practitioner," R. L. Sensenich, M.D., Trustee, American Medical Association, South Bend, Indiana.

Monday Afternoon

HARVEY BARTLE, M.D., presiding: "The Program of the American College of Surgeons in Industry," Frederic A. Besley, M.D., Chairman, Committee on Industrial Medicine and Traumatic Surgery, American College of Surgeons, Waukegan, Illinois.

"Uniformity in Workmen's Compensation Procedure," Voyta Wrabetz, Chairman, Industrial Commission, State of Wisconsin, Madison.

"Bases for Cooperation between Insurance and the Physician in Industry," Ambrose Kelly, American Mutual Alliance, Chicago.

"A Program for Committees on Industrial Health in the State Medical Societies," A. D. Lazenby, M.D., Chairman, Committee on Industrial Health, Medical and Chirurgical Faculty of Maryland, Baltimore.

Tuesday Morning

HENRY H. KESSLER, M.D., presiding: "The Health and Safety Program of the U. S. Bureau of Mines," Daniel Harrington, Chief, Health and Safety Branch, U. S. Bureau of Mines.

"The Public Health Interest in Industry — Federal, State and Local," Warren F. Draper, M.D., Executive Officer, U. S. Public Health Service.

"Industrial Health Activities by Labor Departments in the Government," Alice Hamilton, M.D., Consultant on Industrial Hygiene, Division of Labor Standards, U. S. Department of Labor.

"Independent Programs of Investigation and Prevention," W. J. McConnell, M.D., Secretary Industrial Hygiene Section, A.P.H.A., New York.

Tuesday Afternoon

LEROY U. GARDNER, M.D., presiding: "Industrial Surgery from the General Surgeon's Point of View," Harry Mock, M.D., Chicago.

Symposium on Medical Service to Small Industrial Plants

"Statement of the Problems," Victor G. Heiser, M.D., and Donald M. Shafer, M.D., Consultants, Committee on Healthful Working Conditions, National Association of Manufacturers, New York.

"The Responsibility of the Private Practitioner in Occupational Disease Control," Carey P. McCord, M.D., Director, Bureau of Industrial Hygiene, City of Detroit Department of Health, Detroit.

"Means for Accomplishment," Glenn S. Everts, M.D., Philadelphia.

"Methods of Appraisal," L. D. Bristol, M.D., Health Director, Am. Tel. & Tel., New York.

Monday Morning Session

DR. STANLEY J. SEEGER, Chairman of the A.M.A. Council on Industrial Health, in giving a "Report of the Council on Industrial Health," stated that the American Medical Association had been interested in industrial health problems for many years. At the Atlantic City session of the Association authority was given by the House of Delegates to appoint a Council on Industrial Health, after a resolution introduced at the House of Delegates by the Section on Dermatology in the Kansas City Convention. The conference is but one phase of the work of the Council. Industrial health is relatively young as a field — few persons were very much interested in it 30 years ago, and few realized the importance of the prevention of injury and disease. The lag has been due to the extremely rapid industrial development and the lack of training of medical men in regular schools

and courses. The problems of medical education will not be treated in this meeting, because of the lack of time. Going into past history, in 1915 the Section on Public Health, Preventive and Industrial Medicine conducted a symposium on industrial sanitation. A review of the compensation laws was presented to the House of Delegates in 1915 by the Judicial Council. Reference was made to DR. C. D. SELBY'S classifications of physicians in industry, there being three types, the full-time physician, the part-time physician, and the physician on call. In Milwaukee, the Medical Society of approximately 800 members found that there were three full-time men in industry, three full-time in public health, six full-time on insurance work, 77 on part-time on a salary basis, and 430 handling industrial cases on a fee basis. Statistics avilable show that there are about 49,000,000 persons, gainfully employed in this country, of whom 15,000,000 are to be found in industrial groups; of 8,000,000 workers, about half are found in groups of less than 250 persons. The Council has recognized the importance of the need of clarification of definitions and terminology and has set to work on this problem. There are also the problems of the relation of the physician to management and the problem of the general practitioner as an industrial physician. In this Congress, the important social relationships are to be considered rather than technical problems.

DR. IRVIN ABELL, President of the American Medical Association, in speaking of "The Physician in Industry and Organized Medicine," stated that in considering preventive and curative measures, two factors are of importance: (1) public health administration and (2) private practitioners. It is a matter of history that public health administrators have devoted the past 25 years to the control of industrial hazards. The expansion of industrial hygiene bureaus presents various problems of which interesting groups should be fully cognizant. The general practitioner has the dual role of private practice and industrial health — there is no incompatibility in these which proper training and experience cannot overcome. The objectives of industrial medicine were quoted in detail from a previous editorial in *J.A.M.A.* Industrial medicine should be restricted to preventive principles practiced within the working place. Organized medicine has an unusual opportunity to acquaint the physician with his part in this work. Industrial health has benefited by the various activities of organized medicine, both inside of industry and outside. The profession as a whole is not well trained at the present time — more of the fundamentals of industrial health are needed as common knowledge, and one of the primary functions of the Council is to provide the basis for the spread and use of such material; one of the avenues is the formation of committees in the state medical societies and later in county medical societies which will provide the basis for this work. It should be emphasized that the industrial worker is the central point of all endeavor. All the vital elements of these problems can be brought on a common ground through these various activities.

DR. C. D. SELBY, President of the American Association of Industrial Physicians and Surgeons, spoke on "The Physician in Industry and the Employer." The relationship of the physician in industry to the employer is more or less conventional and is based on training and accomplishment. The physician was first employed to treat occupational injuries, during which he maintained his doctor-and-patient relationship, but he was not a part of the industrial organization. Now the doctor is integrated in the industrial organization and makes use of preventive and control measures in his regular program. In the medical and surgical treatment of diseases and injuries in industry, there is no difference in the technical problems involved, from those met in private practice, but from here on there is a divergence in the following activities: (1) control of exposures in which the physician is associated with industrial hygienists and experts on occupational disease; (2) the assessment of the physical conditions in the plant, especially with relationship to the responsibility for the control of existing hazards — this responsibility depending completely on the physician; and (3) provision for special records which are important and must be individualized. Although the industrial causes of absenteeism total approximately one day per year per person with respect to diseases, and the non-industrial causes produce absenteeism totalling eight to nine days each year per person, a caution must be given to physicians working with industrial organizations with respect to the inadvisability of extending medical services into the field of private practice. It should be obvious that preventive procedures should be restricted entirely to industrial causes. It is essential to work with the profession and the community and not against them. As in private practice, the industrial physician has a chance to fix the level of confidence in the persons whom he serves. In large organizations the responsibility for authority governing medical services is usually placed in the personnel department — there is no objection to this if it is properly and judiciously handled; in the smaller plants it is often the custom for the industrial physician to report direct to the plant manager. It is inadvisable to merge the medical department with the employment or claims departments. The employer is dependent upon the industrial physician for the proper application of medicine to industry; the industrial physician is in turn influenced by the confidence which he creates for himself and his actual worth to the organization; the industrial physician must not forget, however, that it is important for him to command the respect of his fellow practitioners in and out of industry.

DR. LOYAL A. SHOUDY, Chief of the Medical Service, Bethlehem Steel Company, in discussing the subject "The Physician in Industry and the Employee," believed that definitions of in-

dustry and the industrial physician are important as primary considerations. Most persons think of large groups when the word "industry" is mentioned, whereas, as a matter of fact, the large number of employees in industry in this country are employed in small groups. Obviously there are great differences both in the groups and in physicians attending them. Medicine in industry really began some time during the years 1910 to 1915. During the evolution of industrial medicine there was a gradual shift to preventive principles, especially relating to the improvement of working conditions. The workman expects a safe and continuous employment, the right of private communication, and the right of having a private physician. Industrial medicine and surgery is not just an occupation, but one needs a real call and a love of his fellowmen to be successful in this kind of work. There is an unusual opportunity for real health education during physical examinations. The physician also has a great opportunity as a general adviser on all sorts of problems. It is important to keep the findings of such advisory services confidential. The industrial physician is really an engineer, counselor, priest, and adviser, and to secure the best results he must work closely with the foremen. The treatment of non-industrial ailments offers quite a problem, and the employee should be constantly and wisely advised as to the proper procedures necessary; he should also be guided as to his actions. There is a great opportunity in industry for the physician to promote understanding between the employee and the employer and to do this, one must understand the plant and the men. It is as essential to remove the elements of mental depression as to tie up a finger. Experience teaches that it is better to rehabilitate a man on the job. Finally, the industrial physician should betray no confidence and realize he has the great privilege of putting a soul into industry—he must promote friendly understanding.

DR. R. L. SENSENICH, Trustee of the American Medical Association, in discussing the subject "Industrial Health and the Private Practitioner," desired especially to present the viewpoint of the private practitioner in smaller communities. Figures show that 98% of industrial groups employ less than 500 persons. Statistical data regarding the type of practice show that there are practically 345 physicians limiting their work entirely to the field of industrial medicine and 1054 reporting industrial surgery as a specialty. The interest in these types of services varies from major to minor surgery or to surgery of emergency type, and also the entire service varies from the high research type to one of minimum standards. In respect to legal requirements as to the use of physicians and surgeons, great difficulty arises in lack of choice on the part of the industrial worker. The neutral consultant is important — if he functions properly, the employee may not be required to hire a physician. There have been complaints both of general practitioners and of industrial physicians especially with regard to them not availing themselves of specialists' opinions. There have also been complaints of the use of industrial diagnostic facilities in competition with the private practitioner, and the importation of surgeons in competition with local surgical men. In the improvement of medical standards in industrial work there should be: (1) better educational facilities and activities; (2) more specialization; (3) further research; (4) a better point of view engendered in employees who expect too much of the physician who is not specially trained; and (5) education of the public with regard to specialization. In the cooperation of the professional machinery used for the adjudication of cases, special reports to physicians should be requested more frequently and used more commonly; the relationships of the industrial physician and the private practitioner have been made more complicated by the attitude of labor. It is not inconceivable that a neutral medical opinion would be increasingly sought by labor. There is much to be said for the cooperation of the private practitioner and the industrial physician in setting proper boundaries. All need better information on individual health problems. There should be a definition of industrial medicine. The differences are essentially legal and financial. Private practice usually operates as a definite check on many of the professional difficulties. Interpretation has become increasingly difficult in the complicated social relationships which have arisen.

The papers were discussed by DRS. LEVEN, HAYDEN, HOLCOMB, MARBLE, and MR. MARSHALL DAWSON. Emphasis was placed upon the great need for better doctors and the increasing use of specialists. The problem of the future is more and better medical education, including postgraduate courses and all kinds of informative courses for practitioners; discussion avails nothing unless a greater amount of information is disseminated and used.

Monday Afternoon Session

DR. FREDERIC A. BESLEY, Chairman of the Committee on Industrial Medicine and Traumatic Surgery of the American College of Surgeons, discussed "The Program of the American College of Surgeons in Industry." The interest of the American College of Surgeons sprung from a desire to raise the standards of the traumatic surgeon. The report of the Committee on Industrial Medicine and Traumatic Surgery of the College in October, 1926, brought out certain important points; (1) that industrial injuries were not treated by the best surgeon in a great many instances; (2) that first costs received too much emphasis; (3) the problems of certain unethical practices, such as advertising, rate making, and rebates; (4) that the physical well-being of industrial workers was being definitely interfered with by commercialization practices; and (5) that there was a definite desire exhibited by insurance companies and employers to obtain a better standard of surgical service. It has been evident from the very beginning that preventive measures formed a vital part of the industrial program. The problems encountered are largely medical, legal,

economic, and humanitarian. The groups of persons to be considered are the workers, employers, physicians, insurance carriers, and compensation boards. One of the great difficulties has been that the economical considerations have been dominant and that medical services and problems have been given only incidental attention. It was thus apparent that prevention and control are important factors. The first step taken by the College with reference to medical service in industry was the formation of minimum standards for such services, including among other things, the following: (1) the definite organization of services; (2) the selection of competent medical staff; (3) the appraisal of hospitals; (4) the medical supervision of all health work. In 1931 the College started making surveys of medical service in industry and by 1933 a list of 583 approvals had been issued. In October, 1938, a list of 880 approvals was published, making a total of 1710 establishments which had been surveyed up to that time. The subordination of medical departments to other departments in industry has operated to keep the highest type of medical men out of industrial work, but there is now a changing attitude. Medical services in industry are most favorably received and have the best effect where the head of the medical work reports to the administrative officer. The most important problem at the present time is the small industrial group. In conclusion, future activities will be most effective along the lines previously indicated.

MR. VOYTA WRABETZ, Chairman, Industrial Commission, State of Wisconsin, spoke on "Uniformity in Workmen's Compensation Procedures." Adequate care of the industrial handicapped and incapacitated is an obligation of industry and is not to be considered charity or benevolence. The proper administration of such procedures is highly necessary. Going back into history, a review of the old English common law and defenses was given. The compensation laws were designed to offset the disadvantages of that common law and the defenses associated with it. The lack of uniformity of compensation provisions has not been a serious defect because of the small differential involved. It is indeed the height of optimism to expect uniform laws; one must recognize that the common procedures are uniform and that the goal is the same. Physicians should have a uniform approach and procedures, remembering the following points of importance: (1) prompt physical restoration and return to self sustenance on the part of the worker; (2) speed and skill of treatment, without limit of proper care — with the desirability of consultations with specialists when expedient. No plan of compensation for occupational diseases can be practical unless a program of pre-employment and periodic examinations in industry is adequately organized and executed. Any program of medical defense based on the elimination of the unfit is unsound. Many occupational diseases cannot be controlled without proper examinations, but this principle does not warrant the abuse of examination procedures or results. At the present time there is a special committee working on an industrial examination program in the State of Wisconsin. Important factors are proper medical supervision for rehabilitation and adequate instruction of industrial officials. The prevention of neuroses is greatly influenced by the doctor's attitude to the patient, the relatives and the attorneys. The determination of disability is a problem which belongs specifically to the doctor. The problems of scheduled payments as provided for in the States of Wisconsin, Illinois and Minnesota were discussed. Contested cases are of two general types, those involving permanent disability and those involving injury or occupational disease. Estimations of disability and opinions regarding such estimations should be based on medical facts and not on bias. Opinions should be related to scientific findings and not to the side of the case on which the physician is employed. Credit should be properly given to medical men for their work. The profession should weed out incompetents, so that the highest public service may be impartially rendered.

In discussing this paper, DR. HENRY H. KESSLER said there were some differences in the laws, especially with regard to provisions for artificial limbs after injury — only 12 states have such provisions.

MR. AMBROSE KELLY, of the American Mutual Alliance, Chicago, presented the subject "Bases for Cooperation between Insurance and the Physician in Industry." It has been stated that the cost of care of injuries and diseases reaches over $25,000,000 annually. An important consideration with reference to cooperation is the adequate and proper definition and application of the word. In a critical consideration of insurance contracts, it is evident that the premium depends on expenses, the greatest of which are due to medical services. Insurance companies should depend upon the advice of physicians in medical problems, and the companies make the following suggestions for the guidance of physicians: (1) the physician should be competent, reputable, and experienced in his line of work; (2) the office should be properly equipped and convenient; (3) the physician should keep in touch with new developments in his line; (4) he should be familiar with workmen's compensation law provisions and reporting forms and their use; and (5) he should be willing to call on the advice of specialists. It should be realized that the first essential is the welfare of the patient, and that this is common ground on which all meet. A general survey of medical service by insurance companies indicates that such service is good generally. In order to solve the many problems in industrial health and medical work, attention should be given to the following: (1) the small time which is usually devoted to industrial medicine and surgery in medical schools; (2) the lack of postgraduate courses; and (3) the dearth of facilities for keeping in touch with research developments. The greatest source of friction is free choice of physicians; the practice of "lifting" cases

from competent physicians should be condemned. Fees are also a basis for differences — some schedules fix fees, but standardization would probably be impractical. Probably the use of periodic conference groups is the solution of our common problems. The true basis for cooperation is rapid recovery and return to work.

DR. A. D. LAZENBY, Chairman, Committee on Industrial Health, Medical and Chirurgical Faculty of Maryland, Baltimore, presented "A Program for Committees on Industrial Health of the State Medical Societies." Ordinarily the physician has no clear conception of the term "industrial health." An efficient earner means an efficient consumer, and the whole conception of industrial health is a broad one. The health of the industrial worker has been seriously neglected in the past and is indeed a responsibility of the medical profession. State medical societies should: (1) recognize the industrial physician and the specialist and accord him the respect he deserves; (2) realize that the industrial physician as such does not encroach on the ground of private practice; (3) insist upon high standards for industrial physicians; (4) realize the great ignorance existing concerning occupational diseases (one problem in this respect is the lack of reporting of occupational diseases); (5) provide a stimulus on programs for general practitioners, especially relating to subjects of industrial medicine and industrial health — a reciprocal relationship of medicine and business is very necessary in enhancing the teaching role of the profession — it is important that the physician maintain social and economic concepts, as well as medical; (6) fair and careful study of the workmen's compensation laws — the most important consideration is the worker himself — free choice does not permit the best care in general, according to experience; (7) condemnation of members willing to sell their birthrights for a mess of pottage; and (8) close contact with local insurance and claims agencies. In conclusion, an aggressive policy is urged in attempting to solve the problems of health in industry, lest such problems be taken over by lay persons not so well informed.

Tuesday Morning Session

MR. DANIEL HARRINGTON, Chief, Health and Safety Branch, U. S. Bureau of Mines, Washington, D. C., talked about "The Health and Safety Program of the U. S. Bureau of Mines." In 1910 the Bureau of Mines formed a Health and Safety Branch; in the beginning there were six mine safety stations and six safety cars, and at the first safety meeting there were 509 persons certified as first aiders. Reference was made to the silicosis study of LANZA and HIGGINS in 1913, and to the work of LANZA and HARRINGTON in 1914. In 1920 DR. R. R. SAYERS was appointed as Chief Surgeon of the U. S. Bureau of Mines; emphasis has been placed on field and laboratory studies since this time. Health division activities were headed up beginning in 1935 by DR. H. H. SCHRENK. The welfare of 10,000,000 persons was affected by the work of the Health Division and the Health and Safety Branch of the U. S. Bureau of Mines. The group has no legal authority, but acts in an advisory capacity, depending on cooperation through educational work. At present the Health and Safety Branch has a personnel of 99 persons, 82 of whom are in the safety portion and 17 in the health division, mostly in laboratory work. There are activities in every state, the main function being educational work. Contact has been maintained with 500,000 persons in the mineral industries. The principle of associating health, safety and efficiency is alwys kept in mind. There are 475 publications listed with Mr. Harrington's paper, these papers coming out of the work of the Bureau. In the practical work of the Bureau, it has been found that temperature and humidity conditions usually are favorably and vary little; there is some exception to this principle. Coal mines usually have good ventilation, principally on account of the state regulations with reference to gas. However, carbon monoxide is found in poorly ventilated places. Methane rarely is encountered in greater amounts than 1%. The air in metal or non-coal mines is more liable to be contaminated with carbon dioxide, carbon monoxide, nitrous gases, sulphur gas, and gasoline exhaust gas. Some mines are worked wet, but there are many instances of dry working places. There is a lead poisoning hazard in some instances, and the miners may be subject to copper sores, bronchitis, rheumatism, boils, and excess sweating. Dust is the most prevalent exposure and the only safe method is the control of dust, which is an engineering problem. The author prefers the term "pneumoconiosis" to any other. Rock dust can be used as an explosion preventive without providing an additional health hazard if proper wet methods are used in conjunction with the rock dust. Sanitation has been much improved, but still shows evidence of being uncontrolled in many instances. Suggestions for metal mines are as follows: (1) mechanical ventilation with a responsible person in charge, in conjunction with the use of wet methods; (2) strict physical examinations of pre-employment type and periodic examinations every six months; (3) extensive educational activities, and (4) research studies. As to the safety figures of the Bureau, during 1906-1910 there were 13,288 killed in coal mines, or a rate of 5.89 per million tons of coal; during 1936 there were 1330 killed with a rate of 2.72 per million tons of coal — this shows what has been accomplished. There has been an average annual saving of more than 1000 lives. The health figures are not so definite, but the trends indicate that valuable work has been done. The work of the Bureau of Mines with reference to respiratory protection is outstanding and, together with the work on its research relating to gases, is not exceeded by any other group; the results of these researches provide a basis which will be of great future value.

DR. WARREN F. DRAPER, Executive Officer of the U. S. Public Health Service, Washington, D. C., spoke on the subject "The Public Health

Interest in Industry — Federal, State and Local." Industry may be defined as any business employing labor. Figures show that there are 49,000,000 persons gainfully employed in the United States, of whom 15,000,000 to 20,000,000 are found in manufacturing, mechanical and mineral industries. Industrial hygiene activities have been recognized within the past two decades. Environment has a decided influence on the worker. There is greater mortality in the industrial population than in the non-industrial and especially in the non-skilled types of labor; such mortality can be reduced by proper supervision, adequate care, and other factors. There are fewer medical services in the smaller plants and the cost goes up correspondingly. Cost figures for medical services based on an aggregate of one and a quarter million workers show that the cost is $8.42 per person per year in groups of less than 1000, and $13.52 per person year in groups of less than 500. The distribution of industrial workers, according to most recent figures, shows approximately 62% in groups of less than 500 persons. The following problems are indicated as points of attack: (1) disability and lost time due to accidents still bulks large; according to the National Safety Council's figures, there were 19,000 deaths in 1937 due to accidental causes. The minimum rates have not yet been approximated, although the steels have the best experience; (2) certain occupations are still associated with high mortality and high morbidity; and (3) there still remains too high a rate of sickness absenteeism in industry. In general, there has been no significant increase in life expectancy in the middle-aged groups — increased death rates in the middle-aged groups should focus attention on chronic diseases in younger workers. In the larger industries, examinations, placement, control of hazards, and many other important procedures are carried out; the great stimulus to such procedures has been the workmen's compensation laws, 46 of the states making provisions regarding accidental injuries, and 21 making some provision in reference to occupational diseases. Through the cooperative activities of the Division of Industrial Hygiene Division of the U. S. Public Health Service with Federal, state and local agencies, as well as with industry and physicians, state and local governments have established 26 active industrial hygiene units, all but six of these having been put into effect during the past two years — there are commissions of six other states studying the problem of establishing such units. According to statistics, there are five billion dollars lost each year due to industrial injuries and illness; we are spending approximately one million dollars in preventive activities through the state and Federal agencies. Machinery is already set up for research and educational work, and the enlarged program includes administration, development and expansion of local units, and studies and investigations. It is first necessary to determine the nature and scope of local problems; as data are lacking on morbidity, great dependence will have to be placed on preliminary surveys in the various states and these should cover lost time. There are available sickness records through the Division of Industrial Hygiene of the Public Health Service, which, for many years, has gathered experience on 30 plants covering 170,000 persons; an evaluation of our present situation is, therefore, possible. It is expected that the industrial physician will be responsible for the following activities: (1) the regular appraisal of sanitation; (2) periodic inspection of occupational disease hazards; (3) the institution of control measures; (4) prompt and early treatment; (5) reference of cases to family physicians and cooperation with patients and family physicians; (6) adequate absenteeism records; (7) health appraisal of workers; and (8) health and educational programs. The state bureaus of industrial hygiene should be able to: (1) provide consulations with plant managers; (2) give advice to interested groups in reference to the toxicity of new materials; (3) assist in the production and use of absenteeism records; (4) act as a consulting agency to supervisors, state agencies and individual physicians; (5) provide a clinical and hygienic laboratory service; and (6) make provisions for other desirable control measures. The work of the Industrial Hygiene Division of the U. S. Public Health Service consists among other things of the following: (1) determination of threshold limits; (2) determination of the symptomatology of occupational diseases; (3) evaluation of specific occupational diseases; and (4) the development of control measures. Among some of the problems needing investigation at the present time are: (1) organic solvents; (2) mechanics of the action of dust in tuberculosis and silicosis; (3) dermatoses; (4) radiation phenomena; (5) the effects of x-ray and radium exposures; (6) noise and illumination; (7) spectroscopic standards in diagnosis; (8) fatigue; (9) rarefied atmospheres; and (10) engineering methods of occupational disease control. The promotion of health in the factory offers similar problems to health promotion in schools and other large groups. Educational centers are greatly needed for the purpose of producing trained personnel. In summary, industrial hazards are preventable, and the degree of control will be reflected in the community at large.

DR. ALICE HAMILTON, Consultant on Industrial Hygiene, Division of Labor Standards, U. S. Department of Labor, Washington, D.C., discussed "Industrial Health Activities by Labor Departments in the Government." Federal participation in industrial health activities has been fairly recent. The Division of Labor Standards acts in an advisory capacity as a fact-finding and consulting group, especially with reference to codes, and model laws, and realizes that enforcement of such laws and codes is an important feature. One of the greatest obstacles to progress in this work is the lack of trained factory inspectors; the excellent English factory inspection service was alluded to and some of the principal points discussed. Schools for inspectors in this country have been conducted in four instances, in Baltimore, Pittsburgh, and two

in the middle west. Because silicosis offered some of the most difficult problems, the National Silicosis Conference was organized through the U. S. Department of Labor; some of the complicated problems arise because the control of silicosis involves examinations and in some instances, removal from employment. A great portion of the work of the Federal agency thus far has been rendering service to state labor departments. In industry we still have fairly good sized groups where the management denies the existence of any health hazards. There has been no success in attempting to get physicians to report cases of occupational diseases; labor groups are largely dependent upon complaints made by workers, all of which really should be investigated before assuming that they are not well-founded. The first investigation made by the Labor Department was that undertaken by JOHN ANDREWS in 1908, when he was sent to find out about "phossy jaw." State activities in industrial hygiene have been rather recent and New York has the largest unit of 34 people, providing an inspection service, passing on ventilation plans, and doing research in general with reference to industrial health hazards. It is important to have close association of the investigation work with an enforcement department, so that the knowledge may be properly applied. Governmental bodies should provide impartial experts for use in controversial matters. It is essential that all groups cooperate in protecting the industrial workman.

DR. W. J. McCONNELL, Secretary of the Industrial Hygiene Section of the American Public Health Association, of New York City, presented the subject "Independent Programs of Investigation and Prevention." The following groups have done investigation along these lines: (1) private foundations; (2) national associations; (3) universities; (4) trade associations; (5) insurance carriers; (6) industrial and mercantile groups; (7) organized labor; and (8) independent consultants. Of the private foundations, the Air Hygiene Foundation of Pittsburgh was mentioned and the present program in this organization outlined; among the national associations, the following were mentioned: American Association of Industrial Physicians and Surgeons; New York State Society of Industrial Medicine and Surgery; the Association for the Advancement of Industrial Medicine and Surgery; Central States Society of Industrial Medicine and Surgery; Chicago Society of Industrial Medicine and Surgery; Milwaukee Association of Industrial Physicians and Surgeons; Institute of Traumatic Surgery; Michigan Association of Industrial Physicians and Surgeons; American College of Surgeons; American Medical Association; American Public Health Association; American Society of Heating and Ventilating Engineers; American Standards Association; Illuminating Engineering Society; National Safety Council; National Tuberculosis Association; Philadelphia Health Council and Tuberculosis Committee; New York Tuberculosis and Health Association; Saranac Laboratory; Industrial Health Conservancy Laboratories. Of the universities which have offered courses doing special work along these lines are Harvard, Pittsburgh, Pennsylvania, and Northwestern. Trade associations which have promoted special activities are the American Foundrymen's Association, National Association of Manufacturers, and the Portland Cement Association. Among the insurance carriers which have conducted laboratory research or field studies or have otherwise contributed to our knowledge are Aetna, Hartford, Fidelity & Casualty, Employers Mutuals of Wausau, Wisconsin, Liberty Mutual, Maryland Casualty, Michigan Mutual, Employers Liability Assurance Corp., and Zurich. Of the life companies doing group work, the Metropolitan early did work in this field. Among the employers' groups are duPont, Union Carbide & Carbon, Chrysler, General Motors, and Westinghouse Electric. The labor groups have been somewhat backward as to unofficial developments, the exception being the Union Health Center of New York, which was established in 1934. (*Editor's note* — it is impossible to even sketch the activities of these various organizations in this abstract. Reference should be made for summaries of these activities to DR. MCCONNELL's original paper, when it is published.)

Tuesday Afternoon Session

DR. HARRY MOCK, of Chicago, presented the subject "Industrial Surgery from the General Surgeon's Point of View." DR. MOCK sketched the advances made in industrial and traumatic surgery during his 30 years' experience. Too often the surgeon is unprepared for the doing of major surgical work, and there is a distinct ethical principle involved here. Insurance companies have become greatly interested in industrial and traumatic surgery and have gradually insisted upon a better class of treatment. The railroads have done a great deal to elevate the plane of traumatic surgery—there are now 20 railroad surgeons' associations, large and small, where there were none 30 years ago, and the staffs of these groups have set a high standard. Emergency surgery has accomplished a great deal and there have been a number of advances, among them improvement in the technique and intelligent use of blood transfusion, and an outstanding improvement in the technique of care of skull fractures. New groups have been springing up all over the country in relationship to the practice of traumatic surgery, the latest being the American Association of Traumatic Surgeons. The quality of surgery in compensation cases at the present time is as good as that in private practice.

IN THE SYMPOSIUM ON MEDICAL SERVICE IN SMALL INDUSTRIAL PLANTS, DR. DONALD M. SHAFER, Consulant to the Committee on Healthful Working Conditions, National Association of Manufacturers, New York City, presented the paper on "Statement of the Problem," by DRS. VICTOR G. HEISER and DONALD M. SHAFER. In attempting to define what is meant by a small manufacturing group or a small plant, such a connotation has a different meaning in different trades, for a plant of 200 per-

sons is a fairly large plant in certain industries, whereas in others a plant of 20,000 employees would be considered large. We thus see that it is a matter of relativity, but in this paper, a plant having less than 500 persons will be considered small. Statistics show that of the 45,000,000 gainfully employed, 15,000,000 are to be found in commercial units of less than 500 persons, and of the 9,000,000 wage earners in manufacturing groups, 62% are to be found in groups of less than 500. The work of Dublin and Vane on "Health Hazards and Diagnostic Signs" was quoted and referred to in the discussion. It is important to bear in mind that in the small companies the same substances are used as in the larger organizations and provide, therefore, the same hazards, except that there are more operations per man in the smaller groups. Experience has shown that the small plant suffers relatively more from the lost time from accidental injuries, and it is also believed that there are correspondingly larger losses from occupational diseases. The small plant manager, after being convinced of his loss, wants to know what can be done, and after some consideration the final result usually is expressed in hiring the neighborhood doctor to take care of the employees when occasion demands. According to figures, the upper limit of cost per person per year for medical service is established at $13.50—it is believed that to interest the small plant manager, the cost must be made lower. In establishing industrial dispensaries in small groups, naturally the floor area and the equipment must be given detailed consideration. It has been found that a maximum of $350.00 represents a fair financial outlay for the equipment of a dispensary. The manager must be shown tangible returns for the service and the National Association of Manufacturers is attempting to do this, by cooperating with state manufacturing associations and trade associations. A study is now being made of small manufacturers by the National Association of Manufacturers in cooperation with the National Industrial Conference Board. In all this work, the care of the worker is the objective, and several articles and pamphlets have been published, among them, one on the subject "Do Good Working Conditions Pay?" which is addressed primarily to manufacturers. It is the responsibility of the physician to know the hazards and to know what preventive measures can be instituted. In summary, it must be realized what a large number of workmen there are in small groups; that 90% of sickness is nonoccupational; that suitable records and educational programs must be provided; that industry must be educated to the proper kind of medical service at a price which it can afford; and that the small industrial groups must be shown the importance of the improvement of the health of employees and that such a program will yield financial returns.

DR. CAREY P. McCORD, Director, Bureau of Industrial Hygiene, City of Detroit Department of Health, discussed "The Responsibility of The Private Practitioner In Occupational Disease Control." Present indications lead one to believe that the increased need for facilities in carrying on occupational disease control will be provided and probably carried out by the general practitioner and his consultants. The question naturally arises as to whether the private practitioner is ready to accept this responsibility. Aside from treatment, the unusual problems which arise refer to liability, compensation laws, insurance, rehabilitation, and unusual types of preventive measures. The private practitioner seldom has intelligent knowledge of operations and materials used in industry. Perhaps one-half of the spurious claims are partly started off because of the well-meaning physicians being inadequately informed, as to plant conditions. The good plant physician on the other hand is more familiar with the plant and the working conditions and also more familiar with the solution of problems regarding return to work. The industrial worker is probably better supervised by a good plant physician on the premises. However, only a small number of plants provide such physicians. Naturally then, the private practitioner will take care of most of the working population and he will be valuable in direct ratio to his knowledge of plant conditions. In our experience thus far, the private practitioner has not been very much interested in a better understanding of these problems. The difficulties of the relationship and the responsibility of the private practitioner in occupational disease control are many; a few may be summarized:

1. The medical schools do not furnish men with an adequate knowledge of occupational diseases, but the effects of this are somewhat debatable; the number of occupational diseases is small relatively speaking. In Michigan, for the past 12 months, 1014 cases of occupational diseases were reported, involving a group of 6,142 physicians. It is thus plain to be seen that the average in this group is less than one case of occupational disease per physician per year. Since there are 2000 substances which in one way or another may be injurious, it seems really remarkable how well the private practitioner has done his work in this field. Two things are needed: (a) the undergraduate should be given fundamental training in occupational disease work so as to at least be suspicious of the things unrelated to the ordinary diseases of life; and (b) there is great need for larger numbers of consultants to be developed and used; it is remarkable further that internists know so little of the etiology of occupational diseases and that so little clinical material has been assembled in the larger medical centers. Most important is that more guidance should be available through consultants on occupational diseases to the general practitioners.

2. Too great reliance has been placed on the statements of patients, and unfortunately the private practitioner is not prepared to make a real appraisal as to whether such statements are correct or not, relative to plant conditions. (An instance was given of an elevator operator contracting silicosis, in which it was impossible to figure out the etiology until it was discovered that some time be-

fore the employee had been exposed to a silica hazards over a period of seven and a half years.)

3. There is great necessity for the standardization of terminology and definitions, because of the present unsuitable terminology and conflicting classifications. Hernia is classed as an accident in some states and as an occupational disease in others; the same is true of carbon monoxide gassing. It is acknowledged that benzol poisoning may be either an accident or disease, according to the conditions of exposure and the effects.

4. Trade names of various substances used in industry are very often confusing and do not indicate what is in them. The usual experience is that the formula is identified by a number, which gives no indication of its chemical contents; very often the foreman does not know, and the superintendent is uninformed, and it is with great difficulty that it is possible to run down the chemical constituents in certain types of compounds in general industrial use. Although the total number of occupational diseases seen by one private practitioner is small, the aggregate amounts to a considerable number of cases and the cooperation of physicians with all groups is necessary to secure adequate information. In summary, the private practitioner should know more about the worker and the working place, and he should be acquainted with the details of such experiences in his community. He should utilize state and local authorities and also independent consultants, and he should know enough about the problems to be suspicious. Finally, it is necessary that the private practitioner have a change of attitude and appreciate his obligation to industry, and further, to lose sight of the immediate injury as the sole problem, rendering service to the workman, and also to the employer and the community.

DR. GLENN S. EVERTS, of Philadelphia, spoke on "Means for Accomplishment." Beginning in 1926, through the work of the Philadelphia Health Council and Tuberculosis Committee, there were demonstrations given in Philadelphia showing that the small industry could have competent medical services. Originally the plan was developed for 2500 employees and based on the introductory procedure of doing free examinations for tuberculosis. The demonstration ended in December, 1932. The principal difficulty which arose during these demonstrations was the establishment of a part-time schedule for physicians and nurses. The solution for this problem was found in combining several plants in the units of 1000 employees to be served by a full-time nurse and a half-time physician. In a modified plan, arrangements were made with two visiting nurses' societies, and eventually private industrial physicians were used for the medical work. Deterrents to the successful culmination of the plan were found to be mainly expressed in the lack of interest on the part of employers and physicians. An important point in the nursing services was the establishment of substitutes for each industrial nurse. In the final plan, it was decided that a minimum of three hours' service per week should be rendered per 100 employees, two hours for the nurse and one hour for the physician. It was discovered, however, that this amount of time had to be increased in a number of instances, as the demand necessitated. The scope of the service with some few changes remains about the same as in the beginning: (1) physical examinations of all employees occupying about 17 minutes each; (2) physical examinations of new employees occupying the same length of time; (3) annual re-examinations of all employees consuming about 15 minutes each; (4) first aid assistance provided in accident cases; (5) hospital emergency service arranged; (6) redressings for previous injuries on the job or at the dispensary; (7) reference of cases to oculists; (8) reference of proper cases to the family doctor; (9) provision for the correction of defects with follow-up calls at the dispensary; (10) health educational programs; (11) industrial hygiene and sanitation inspections; and (12) an accident prevention program including proper reporting and follow-up of cases. As to cost, it was found necessary to provide a space for a two-room dispensary and to arrange for the payment of this space; the equipment was found to vary in cost from $200.00 to $400.00; it was finally established at the pro rata share of $4.50 per employee per year. Experience proved that the minimum three-hour plan was inadequate for even the small plants however, after the service was fairly well established. As to interesting the employer, it was found that the direct interview was the only effective way. There were over 900 interviews consumed in providing a service for approximately 4000 employees and in one instance, the maximum number of interviews was 11. Among the objections cited the cost did not form a relatively important point. It was found to be a relatively easy matter to consult industrial executives, and it was further found that if adequate suggestions were accepted by physicians this acceptance provided an excellent cooperative basis. In summary, the following points were found important: (1) the use of a "health salesman" in establishing contacts and selling the service; (2) some means to help the private practitioner learn more about industrial health work; and (3) the use of a flexible nursing service. It is believed that local medical societies should be prepared to give advice and suggestions on these points and that, further, the Council on Industrial Health might give valuable aid.

IN THE absence of DR. L. D. BRISTOL, Health Director of the American Telephone and Telegraph Company, of New York, DR. C. W. ROBERTS, of Atlanta, read the paper on "Methods of Appraisal." There has been a distinct change in attitude from emphasis on injury and occupational diseases to broad health problems. Appraisal forms, questions and schedules devised some time ago by the author have formed the basis for preventive procedures. The standard form presents evidence of what has been done and the progress made, the greatest value being periodic self-analysis and comparison. At the outset, only tentative gradings

should be attempted; after some experience with the use of the forms, the maximum score should indicate the efficacy of the complete program. In a few words, the appraisal system accomplishes the following objectives: (1) provides a definite list of activities; (2) aids in planning future activities; (3) provides the extent of the administration of the health plan, by affording ratings, and also through the same means, the measurement of progress; and (4) strengthens interest in health activities within the group. These methods of appraisal may have their greatest usefulness in small concerns, for, as the National Industrial Conference Board study shows, of a group of 800 concerns, 450 showed an industrial population of greater than 500 and 350 showed an industrial population of less than 500 employees. The cooperation of various associations is needed to make this plan a success.

DR. E. L. BELKNAP, of Milwaukee, summarized the important points in the symposium, and his experiences with a group of 800 employees.

The Annual Physical Examination

—Its Effect in Raising Standards of Employee Health and Efficiency—

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IN RECENT years industrial management has recognized the rising cost of accidents, and has made huge expenditures in an effort to curtail this form of waste and suffering. The trend today among Workmens' Compensation Boards in the various States appears to be toward the adoption of an increasingly liberal attitude with regard to employee injury claims, particularly in cases involving aggravation of some pre-existing disability, which was due either to a former injury or physical defect. Decisions in such cases often result in the payment of compensation for permanent total disability, and many employers have been faced with a rising cost of insurance for workmens' compensation as a result.

The problem has been most acute and the expense greatest in those industries where the worker is required to undergo strenuous physical exertion. A business that employs men with "strong backs" is by its very nature ordinarily classified as hazardous. The employee is usually of a class that is not "health conscious," and who frequently is drawn from the ranks of men who are constantly shifting from one job to another. This shifting element in labor has been given great emphasis in recent years by the trend among larger and older industries to supplant older workers with younger, healthier, and more vigorous men.

Industry has been forced to recognize the need for carefully selecting men for jobs involving considerable physical effort, by their adverse experience in workmens' compensation cases, particularly those involving "aggravation," such as arthritis in spinal injuries, varicose veins, herniae, diabetes, syphilis, and strangely, but all to frequently, an unrecognized amblyopia.

Pre-employment physical examinations can and do protect the employer to a great extent from becoming unfairly penalized under certain aspects of our compensation laws. They have also reduced labor turnover and promoted public as well as employee safety. A great deal has been written about pre-employment examinations, but the real problem confronting industry today is the maintenance of employee health. This is especially true because of present changing employee-employer relationships, and because of the growing attitude on the part of Workmens' Compensation Boards, and other public authorities, to make industry "take care of its own."

It has been estimated that non-occupational diseases and accidents entail 13 to 15 times the amount of lost time as do occupational accidents. The importance of this problem is self-evident, and the periodic physical examination, for the purpose of determining employee fitness for work, is reaching a growing importance from a safety standpoint. Such examinations also serve as a means of promoting health and efficiency of employees by giving them the benefit of proper advice for the care of defects, which, if neglected, usually lead to ill health. The importance of eradicating foci of infection, the maintaining of optimum weight, the early recognition and treatment of diabetes, turberculosis and syphilis — all of these and many more, are well known to industrial physicians and enlightened employers.

IN March, 1935, U. S. Truck Lines, Inc., of Delaware, an organization embracing 16 operating companies engaged in various phases of transportation work, inaugurated a program of periodic physical examinations of employees. In addition, all applicants for employment were subjected to physical examinations before they were allowed to start work. Those men who were found to have remedial defects were notified and asked to cooperate in their correction by securing the necessary treatment from their family physicians or dentists. Those men whose condition was such that they were considered a menace to the safety of themselves, their fellow workers and the public, were disqualified for service. At first this program encountered considerable opposition on the part of the labor unions involved, but today most union officials have recognized the benefits that accrue to the workers themselves through this program, and very little antagonism has persisted. The period of education, however, has been an expensive one, for cases have been experienced where a diabetic driver lapsed into a coma and was killed, a cardiovascular sufferer died at the wheel, and color blind drivers have been injured — to mention only a few of such experiences.

TABLE I
RESULTS OF PHYSICAL EXAMINATIONS OF EMPLOYEES OF U. S. TRUCK LINES, INC. OF DELAWARE

	1935		1936		1937	
Total Number of Employees Examined	3072	100.0%	2406	100.0%	1049	100.0%
Number Without Physical Defects	1864	60.6%	1582	65.7%	715	68.1%
Number With Physical Defects	1208	39.4%	824	34.3%	334	31.9%
No. Corrected	(436)	(36.0%)	(282)	(34.2%)	(222)	(66.4%)
Hernia	116	9.6%	110	13.3%	43	12.8%
No. Corrected	(33)	(28.4%)	(12)	(10.9%)	(3)	(7.0%)
Vision	227	18.7%	211	25.6%	162	48.5%
No. Corrected	(119)	(52.4%)	(129)	(61.1%)	(138)	(85.1%)
Cardiovascular	172	14.2%	106	12.8%	48	14.2%
No. Corrected	(46)	(26.3%)	(41)	(38.6%)	(4)	(8.3%)
Tuberculosis	12	0.9%	0	0	1	0.3%
No. Corrected	(2)	(16.6%)	(0)	(0)	(0)	(0)
Deformities	15	1.2%	11	1.3%	7	2.0%
No. Corrected	(0)	(0)	(1)	(9.0%)	(0)	(0)
Acute Venereal	0	0	2	0.2%	2	0.6%
No. Corrected	(0)	(0)	(1)	(50.0%)	(0)	(0)
Albumen	32	2.7%	21	2.5%	12	3.5%
No. Corrected	(12)	(37.5%)	(6)	(42.8%)	(6)	(50.0%)
Sugar	16	1.3%	9	1.1%	4	1.0%
No. Corrected	(6)	(37.5%)	(3)	(33.3%)	(2)	(50.0%)
Hearing	0	0	0	0	1	0.3%
No. Corrected	(0)	(0)	(0)	(0)	(0)	(0)
Teeth	435	36.0%	226	27.4%	110	32.9%
No. Corrected	(186)	(42.7%)	(76)	(33.6%)	(59)	(53.6%)
Tonsils	153	12.6%	51	6.1%	25	7.4%
No. Corrected	(32)	(20.9%)	(13)	(25.4%)	(4)	(16.0%)
Other Defects	30	2.4%	37	4.3%	34	10.0%
No. Corrected	(0)	(0)	(0)	(0)	(6)	(17.6%)

The accompanying Table I sets forth the results of physical examinations since 1935 to, and including, 1937. The figures include both old employees and applicants for employment. Men who were discovered to have defects, but who were permitted to remain at work, were advised of their defects and illnesses by letter and requested to have their family physicians, oculists or dentists inform the Chief Surgeon's office when their defects had been corrected. The table sets forth the manner in which the men have responded to this advice. It is apparent that the correction of these defects and the cooperation on the part of the men within the short space of three years has markedly improved.

TABLE II
RESULTS OF FIRST GROUP OF RE-EXAMINATIONS IN 1938

		Percentage
Total Number of Employees Examined	508	100.0
Number Without Physical Defects	456	89.7
Number With Physical Defects	52	10.3
Hernia	2	3.8
Vision	6	11.5
Cardiovascular	5	9.6
Tuberculosis	0	0
Deformities	0	0
Acute Untreated Venereal	0	0
Albumen	2	3.8
Sugar	1	1.9
Hearing	0	0
Teeth	34	65.3
Tonsils	0	0
Overweight	2	3.8
Other Defects	0	0
Miscellaneous Disqualified*	5	0.9

*(1 for kidney defect; 2 for hernia; 2 for vision; omitting the two disqualified for hernia, only three were removed from service or 0.5%)

Table II represents the results of the first 508 examinations made during 1938 of employees who had been previously examined. In this group, there were only 52 men who had any defects whatever, and 65.3% of these defects were carious teeth. It was found necessary to remove only three of these men from service for serious cause: one had a severe and progressive Bright's disease, and the other two had physical defects which could not be sufficiently corrected to warrant their being qualified for safe driving. Therefore, only a little over one-half of 1% of all of the regular employees in this group who were re-examined were found to be unfit for their type of employment. Examinations for U. S. Truck Lines are conducted by Doctors over a widely scattered area from Baltimore, Maryland, to Chicago, Illinois. The results of this program have been most gratifying and the management feels that periodic examinations have been instrumental in achieving lower costs of operation, reduced labor turnover, better public relations and improved employee health. In addition, a number of important discoveries have been made which have a direct bearing upon operating efficiency and compensation expense. For example, it was found that a great majority of employee injuries were

experienced by new men, both dockmen and drivers who had less than three months' experience with the company. As soon as this became apparent, the management immediately took steps to correct the situation.

Everyone knows that a healthy employee is bound to be more efficient than one who is suffering from some annoying or insidious illness which he himself may not recognize. The money expended in promoting the standard of health among employees pays sizable dividends in increased labor efficiency.

The Treatment of Arthritis

—and Associated Conditions: A Preliminary Report—

LAURENCE H. MAYERS, M.D.,
and
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THROUGH clinical trial the profession has learned that the various forms of therapy advised for arthritis show a limited percentage of favorable responses to treatment. Not uncommon in the literature on this disease are accounts that report improvement in 60% of 180 cases; 65% of all cases; 47% of 100 cases; 48% of 27 cases. Despite the many forms of therapy employed, however, there remains a large number of patients who are unimproved, regardless of the treatment given. These persons form that great army of unrewarded arthritics who eventually become chronic cases and who present a sharp challenge to the profession.

Early in 1938, one of us (L.H.M.) received upon request through an English investigator a small quantity of "a parenteral acid preparation"* reported as having been successfully employed in the treatment of arthritic patients. The initial experience stimulated active interest, leading to the employment of this preparation in a series of 105 cases, most of them the chronic type referred to above. With these patients we believe we have demonstrated clinically the superiority of the new treatment over other forms of arthritis therapy in respect to (1) rapidity of action, (2) absence of reactions, and (3) safety.

Ten years ago, Dr. Eduard Lyss, of Biel, Switzerland, developed a form of therapy for the administration of three commonly used therapeutic agents: sulfur, iodine, and formic acid combined with a terpene. In its present form the new preparation represents a refinement of that original combination. Per cubic centimeter, it contains formic acid, 0.0018 gm.; 95% alcohol, 0.055 cc.; iodine, 0.004 gm.; sulfur, 0.0002 gm.; terpene (camphene from Borneol camphor) 0.0001 cc. with distilled water q.s. ad 1 cc. The combined amount of the component drugs is equivalent to one drop. Terpene enters into the formula as a volatilizing agent, rather than for any therapeutic action of its own.

* An ethical proprietary preparation, known as Aciform II.

Medical science is familiar with the pharmacodynamics and therapeutic action of all the components of this new product so far as studies of their action have been recorded. Each has been accorded its place in the materia medica and each has been used in the treatment of arthritis. However, these three drugs combined with a terpene form an entirely new preparation, creating a synergistic action already proved to have a unique value, therapeutically.

Professor-Doctor Hans Eppinger,[2] of the University of Vienna, has carried on much of the clinical and experimental work with the preparation during the last four years at the First Medical Clinic in Vienna. Two of his associates, Drs. Erlsbacher and Burger, reported the following[2] concerning their cases under treatment:

TABLE I
RESULTS OBTAINED IN 103 CASES OF ARTHRITIS AND ASSOCIATED CONDITIONS
at the
FIRST MEDICAL CLINIC OF VIENNA — DOCTOR HANS EPPINGER

No.	Cases	Injections	Complete Imp. %	Slight Imp. %	Negative
50	Acute Myalgies	3-4	100		
	Chronic Myalgies	8-20	84	12	4
28	Acute Neuralgies	6-8	100		
	Chronic Neuralgies	12-20	65	30	5
9	Humero-Scapular Arthritis	8-12	75	25	
16	Sciatica	3-20	85	10	5

The new preparation produces its most spectacular results in acute cases, such as the acute myalgies, neuralgies, muscle spasm, and lumbago. In chronic cases, the period of treatment necessary before there is a definite clinical improvement is from three to six months, results which other procedures for the treatment of arthritis and associated conditions have seldom demonstrated. The relief of sciatica and lumbago has been dramatic in its suddenness and in the number of favorable responses to treatment. The immediate relief of pain and the removal of muscle spasm, which we have shown in a greater percentage of cases under the new parenteral acid therapy than with other forms of treatment, provides a valuable subjective response on the part of the patient. Similarly, there is favorable objective response in the return of normal circulation in the affected part with the subsequent production of a more normal function.

In our work we have found no malaise or digestive or bowel upsets attendant upon or following the injections. This factor greatly widens the range of application and effectiveness of the treatment, for, of the some 2,200 proprietary preparations for the treatment of arthritis, 40% depend upon the digestive organs for tolerance and subsequent absorption into the tissues and circulatory system for distribution. The variability of the range of tolerance of the digestive system and the time required for the drug to reach and aid the af-

fected part indicate something of the inconstancy of the results obtained by such means. The new preparation obviates these factors and thus its more extensive use is permitted.

This new product produces no anesthetic changes. It is not an anesthetic. It does not affect mobility or the reflexes in the injected part and each may be demonstrated without impairment immediately following injection.

The mode of action of the new preparation is admittedly obscure and empiric. It is thought that the components in the presence of the terpene are diffused and disseminated in the tissues in an action comparable to that evidenced in greater molecular dissociation. The therapeutic principle of the parenteral acid therapy is presumably the restoration of normal circulation in an affected part, the elimination of toxins resulting from tissue damage, and the production of lymph flow with the resultant removal of tissue edema. Such action permits cellular repair and a return to a more normal function. This new therapy has the advantage of producing such results immediately and safely by injection into the involved and adjoining areas.

In short, the new parenteral acid therapy is a safe, convenient, and quick office procedure, which requires no elaborate equipment for its administration. Its effectiveness in the treatment of arthritis is indicated not only in the patient's subjective responses, but also in very notable objective improvements.

Prodromal symptoms such as cramps, weakness of muscles, muscular wasting, paraesthesias, vasomotor disturbances of the extremities, tremors, and fatigability can be relieved by this form of treatment, we find. The course of the disease, which reduces the general health and aggravates the symptoms, can be abated with this therapy more quickly than with any other therapy used in our combined experience. The new preparation relieves muscle spasm and reduces pain, thus allowing active movement early in the course of the disease. In this way, faulty positions and deformities can be prevented. When arthritic manifestations in both the small and large joints are advanced and when muscular pain and wasting are extreme, the new therapy is more effective than any combination of other measures we have employed.

The assumedly less virulent germs, considered as commonly present in arthritis, are not overly toxic or destructive to tissues. Such tissues as are assaulted by these bacteria are given an excellent chance for repair when normal circulation can be rapidly restored to the involved area. From our clinical observations, we think that the new parenteral acid therapy activates the restoration of normal circulation. Despite the fact that this action may be only temporary, its repeated application, it is believed from our clinical experiences, will allow the tissues to secrete their normal efficient ferment and thus promote healing.

This is a form of therapy that will remain in the hands of the physician during the entire course of the disease. It cannot be prescribed by the druggist to the laity. The pseudo-scientist, because of his lack of familiarity with regional anatomy as employed in regional anesthesia, cannot use it.

Rationale of Injection

THIS is one of the few drugs that requires a definite technic for its administration, such technic being best learned by demonstration. The proper technic in the handling of this procedure demands the knowledge of regional anatomy that is used in regional anesthesia. This, with most doctors, merely requires a review of former experience and knowledge.

In examining the affected part, the area is thoroughly palpated for local points of tenderness and muscle spasm. These areas usually follow the innervation of the region and, when localized, the hypodermic injection is given directly into the tender points. When generalized pain is present over the entire arm or leg, the injection is made into the region of the main nerve supplying the part. Immediate relief, in acute cases and acute exacerbations in chronic cases, usually follows such perineural injections even though the site of injection is not into the actual involved area. In the involvement of the entire shoulder and arm, immediate relief is usually provided by brachial block from the supraclavicular approach.

With pain in the hands and feet, the involved areas are relieved by injections about the nerves in the forearm and lower leg, respectively. In acute inflammatory pain in the great toes—gout, for example—one or two injections directly into the base of the inflamed area will usually suffice. In cases of knee edema and pain, the area is injected at painful tender points as localized by palpation. The likely response to this procedure is a reduction in acute edematous swelling, the abatement of pain and muscle spasm, and a return to a more normal function in the area. The parenteral acid therapy differs from other methods used in the relaxation of muscle spasm in that there is no associated systemic reaction following the injections.

Backache and the associated sciatic syndrome comprise a large part of the complaints that many patients offer. The problems of diagnosis of the proper etiology and the manner of the production of the symptoms require a thorough physical examination, an x-ray check-up, and a differential diagnosis of the various possible causes. Foremost among the latter are traumatic backache, postural backache, reflex backache, low backache from diseased facets, sacro-iliac strain and subluxation, and local tissue derangement. The work-up necessary for diagnosis usually entails considerable time during which period the distressing symptoms persist. It is during this interval that the therapy here described lends itself advantageously to the relief of pain; this factor, in turn, makes for greater cooperation on the part of the patient.

In acute low back pain, when local areas of tenderness are not found, the injection is made with a one-inch needle, deep into the lumbar musculature. The same procedure is followed in lum-

bagoes. In sacro-iliac complaints, the injection is made directly over the area, care being taken to avoid injuring the periosteum with the needle.

The immediate burning sensation accompanying nearly all injections, regardless of site, passes within a few seconds after injection. The amount given per injection ranges from ½ to 5 cc., depending on the site and amount of involvement. Effective treatment usually requires several such injections about the affected parts. Total injections at one time up to 10 or 20 cc. have occasioned no malaise or toxicity, nor do the injections produce anesthetic changes.

The clinical evidence for our findings concerning this new therapy rests, as we have stated, in a series of 105 cases, clinically investigated and treated over the past six months. In reporting these cases, we have relied on both objective and subjective findings. The bulk of the cases comprising this report are chronic arthritics. Hench and others[1] say that the usual debate as to classification of arthritis finds some workers "considering atrophic and hypertrophic arthritis varieties of one disease, differences being chiefly due to the factor of age, physiologic rather than calendar. To them atrophic arthritis represents the reaction of physiologically young tissues against an insult; hypertrophic arthritis is the reaction of physiologically aging tissue against the same insult."

Typical of our findings are the following 20 cases treated at the hospital clinic and in our private practices.

CASE 1. A research engineer, aged 40, complained of pain over the lumbar and coccygeal regions and over both sacro-iliac joints for a period of 18 years; more recently, pain and intense discomfort coupled with swelling have developed over the left heel and between the right great and first toes.

Examination revealed purpura hemorrhagica distributed downward over the legs. There was pain and tenderness over the lumbar and coccygeal regions, extreme tenderness over the left heel, painful swelling between the right great and first toes, and intense pain along the course of the right sciatic nerve.

X-ray studies of the spine, knees, ankles, and feet showed bony spurring on the bodies of the vertebrae and roughening of the articular surfaces of the knees, ankles, and the small bones of the feet characteristic of osteoarthritis. There was also some demineralization of the bones of the feet.

Treatment during the course of his disability began with the removal of fragments of the lumbar spinous processes following a saddle injury to the lower lumbar region. This was followed one month later by reoperation and curettment. Other treatment consisted of Swedish massage, accompanied by cabinet, tub, and mineral baths, one to two times a week for 18 years; infra-red and ultra-violet light treatments every two weeks for 10 years; a course of potassium and iodine injections weekly for six months; and fever treatments for five months. On June 6, 1938, he entered the hospital for additional treatment.

Aciform II therapy was instituted on September 7, 1938. He received a total of 5 cc. at six sites along the right sciatic nerve, over the left os calcis, and between the right great and first toes. Six treatments were given at weekly intervals.

Following the first treatment, he received relief from pain for 12 hours in all areas injected. Following the third treatment, he was able to wear shoes for the first time in two years. By the end of the series, he had improved markedly. Now more physically fit than at any time since the original injury, he is able to resume his work.

CASE 2. An office worker, aged 50, was admitted to the hospital on August 29, 1938, suffering from severe pain in the lumbosacral region and along the course of the right sciatic nerve. The pain had developed progressively. The diagnosis was hypertrophic arthritis with acute sciatica on the right side.

Findings at the physical examination were essentially negative except for the localized injury over the sacro-iliac region and demonstrable pain along the course of the right sciatic nerve.

The x-ray diagnosis, in view of the early bony proliferation about the neck of the right femur and acetabulum, was hypertrophic arthritis.

Previous treatment consisted of the following: Diathermy, twice weekly for six weeks; massage, three times a week for six weeks; exercise, six weeks; local heat, six weeks; and supportive measures, five weeks. There was no improvement in symptoms.

Aciform II was first injected on September 6, 1938, with three 1-cc. doses into the right gluteal region and leg, as shown in Fig. I B. A total of three treatments were given at the weekly clinic.

The first treatment brought relief from pain for 72 hours; four days relief followed the next treatment, and after the third treatment, the sciatic pain disappeared and the patient volunteered to leave the hospital and return to work.

CASE 3. A waiter, aged 54, had pain involving the feet, hands, left elbow, and lower cervical spine. The pain had been present over these areas since 1931, during which period there had been a gross enlargement of the knees together with marked limitation of motion. The pain and symptoms could not be accounted for in any previous infectious illness. Examination revealed spasm over the erector spinae muscle group, together with marked reduction in grip and painful swelling over all the involved joints.

Roentgenographic examination of the entire spine and multiple joints revealed the roughening of the joint spaces and the bony spurring on the vertebral bodies indicative of atrophic arthritis. Enlargement of both knees suggested synovitis.

Previous treatment had consisted of symptomatic medication, seven years; active and passive exercise, seven years; contrast baths, seven years; diathermy, five years; supportive measures, seven years; and local heat, seven years. No lasting benefits resulted from any of these measures.

Aciform II therapy was first begun on September 7, 1938. He was given four weekly treatments,

each consisting of local injections about the knees and adjacent involved areas.

Relief from pain was noted for 18 to 24 hours following the initial treatment. With subsequent treatment, there was progressive diminution in the amount of pain and disability. At the end of the course, the patient returned to his work.

CASE 4. A railroad fireman, aged 48, complained of joint pains over the right elbow, both hands, both ankles, both feet, and cervical spine. The original involvement began in the wrists in 1927. The following year, he suffered an injury to the right elbow and the arthritic process progressed to both hands, ankles, feet, and cervical spine. Except for a compensatory left dorsal, right lumbar scoliosis, swelling of the interphalangeal joints, and limitation of motion in the right shoulder and elbow, the physical examination was negative.

X-ray examination of the cervical, dorsal, and lumbar spine and the sacro-iliac joints showed evidence of atrophic arthritis. There was roughening of the articular surfaces of the ankles, the small bones of the feet, the hands, and the wrists, resembling arthritis.

Previous treatment had consisted of the following: Exercise, 11 years; diathermy, six years; local heat, eight years; massage, twice weekly for 11 years; symptomatic medication, 11 years; and contrast baths, once weekly for 10 years.

Aciform II injections were given at weekly intervals for three weeks into the lower cervical and adjoining involved areas in conjunction with local injections into the right arm and wrist. On one occasion, a brachial block was given as illustrated in Fig. 5.

The swelling about the elbow was reduced and all joint pains were relieved with the single exception of general pain over the right wrist and hand.

CASE 5. A stockbroker, aged 59, had, in addition to pain and swelling over both ankles and both sacro-iliac joints, pain, stiffness, and limitation of motion over the lumbar and thoracic spines. Onset of symptoms began four years previously and he had been hospitalized for several periods, each of several months duration.

The physical findings indicated that indefinite pains were present about the spine and multiple joints, but that the acute symptomatology referable to arthritis had subsided. There was slight restriction of motion over the spine and visible erector spinae muscle spasm. Pain was evidenced on deep percussion over the spine and sacro-iliac joints.

Roentgenographic studies of the spine, sacro-iliac and multiple joints showed spurring of the bodies of the vertebrae, partial fusion of both sacro-iliac joints, and roughening of the articular surfaces of various joints. All findings were characteristic of osteoarthritis.

Previous treatment had included two courses of fever therapy accompanied by massive doses of vitamin D. In both cases, he received only temporary relief from pain and symptoms.

Aciform II therapy was begun on October 29, 1938, and continued through November 9, 1938, during which time a total of three treatments was given. Each treatment consisted of multiple injections along the course of the spine and about the neck.

The patient responded promptly to the injections; there was immediate relief from pain over the entire back, following the initial treatments. On the occasion of the first treatment, palpably

Fig. 1-A.

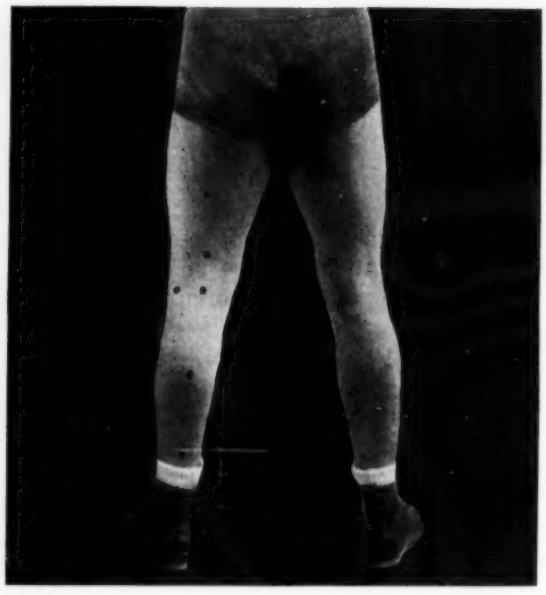

Fig. 1-B.

Fig. 2.

Fig. 1-A (Case 1): The course of the deep peroneal nerve posteriorly, to its terminal branches in the great and second toes. Fig. 1-B (Case 1): Posterior view of the leg showing the injection points along the course of the sciatic nerve and the posterior tibial nerve. Fig. 2 (Case 3): Points of injection about the knee in arthritis and traumatic contusions

spastic muscles over the mid-back were immediately relaxed and there has been no return of spasticity.

CASE 6. A professional man, aged 45, awoke with severe pain in the right back accompanied by stiffness and marked restriction of motion. The symptoms persisted over a period of four days, during which time heat and rest effected no change in symptomatology. Examination revealed erector spinae muscle spasm. Aciform II was given on one occasion directly into the muscle belly on the right side with immediate relaxation of spasm and immediate cessation of pain, stiffness, and disability.

Fig. 3.

(Case 5): The points of injection into the musculature over the lumbar nerve roots of the lower back. Also shown are the points of injection for the sacro-iliac joints

CASE 7. A general laborer, aged 45, had sciatic neuritis on the right side and pain over the wrists and ankles. This condition had been present over a year. After leaving the hospital in the fall of 1935, at which time he was treated for a chip fracture of the ankle, he remained in good health until December, 1937, when severe pain developed in the back. It then progressed to the wrists, ankles, and adjacent areas. Tonsillectomy relieved him of pain so that he was able to walk. However, despite this measure, the pain persisted to a slight degree, and recently had grown worse.

There were no physical signs of injury or inflammation. There was pain in the right leg, extending from the buttocks down the posterior aspect of the leg and on the lateral side of the calf. The x-ray findings were essentially negative, showing no bony changes that would account for the pain.

Previous treatment had consisted of massages, twice weekly; hot and cold baths, twice weekly; daily exercise; removal of foci of infection; and local heat and light, three times weekly over the past year. Only temporary relief was received.

At weekly intervals on three occasions, he rereceived Aciform II injections at sites along the course of the right sciatic nerve. The marked relief of the leg pain, which previously had been so evident on motion, as well as the relief of the back pain, caused the patient to leave the hospital voluntarily.

CASE 8. A railroad worker, aged 53, had pain over the course of the left brachial plexus. After suffering a crushing injury to the left shoulder and upper arm in 1929 while coupling freight cars, he had a persistent pain, as well as tenderness and limitation of motion, especially over the deltoid area; coupled with this was marked weakness of the muscles of the arm and forearm.

With the exception of the painful area surrounding the site of the original injury, the examination was essentially negative. There was revealed marked atrophy of the muscles over the shoulder girdle and similar atrophy extending over the entire arm and forearm. Weakness was evidenced by nearly complete loss of function.

Previous treatment consisted of nine year's rest; opiates; infra-red treatments, twice weekly for nine years; and massage, once weekly for nine years. No beneficial results were obtained.

Aciform II therapy was instituted August 30, 1938, with weekly injections until September 20, 1938. Each treatment consisted of injections as brachial blocks as well as local infiltrations over the lower cervical spine and along the borders of the trapezii.

Relief from pain was immediate and he was able to sleep after the first treatment without the administration of opiates. Clinical improvement progressed with each additional injection until a series of five treatments had been completed. At the close of the series, pain had disappeared and an almost complete range of motion had been restored to the left arm.

Fig. 4.

(Case 7): The course of the sciatic nerve and its division into the common peroneal nerve and the posterior tibial nerve

CASE 9. An office worker, aged 44, complained of neuritic pain associated with a fracture of a spine graft. After a Hibbs-Albee spinal fusion for spondylolisthesis in 1934, the patient remained free from osteoarthritic symptoms until April, 1938. At that time, there developed a sudden onset of severe lancinating pain in the coccygeal and lower lumbar region on both sides and also neuralgic pain radiating down both legs.

The physical examination was essentially negative except for the localized tenderness along the right side of the level of the third and fourth lumbar vertebrae and pain down both legs. Examination disclosed fixation of the graft at the level of the fifth lumbar vertebra, the fracture of the graft being at the level of the third and fourth lumbar vertebrae.

Previously, the patient had had massage, twice weekly, and heat (infra-red) and light treatment

weekly over a period of six months. These measures, instituted with the persistence of severe pain, failed to relieve his discomfort. It was thought advisable to open the fracture site for repair of the graft.

Two cc. of Aciform II were injected on August 26, 1938, at the level of the third and fourth lumbar vertebrae on the right side. There was immediate cessation of pain, both in the legs and lumbar region. There has been no recurrence of pain and further therapeutic or surgical methods are deemed unnecessary. Injection sites are illustrated in Fig. 3.

CASE 10. A former layout man, aged 42, complained of pain and spasm accompanying a corrected fracture of the tibia and fibula. He entered the hospital on June 5, 1938, complaining of severe pain in the right leg, just above the ankle, accompanied by swelling and inability to place any weight on the foot. He reported that a misstep off a curb had resulted in this condition.

The ankle and lower leg were marked by pain on manipulation, as well as by tenderness and swelling. Examination disclosed a fracture of the right tibia and fibula just above the medial malleolus of the ankle.

Because this pain involved an area supplied by the sciatic and peroneal nerves, Aciform II was injected along the course of these nerves in an effort to relieve muscle spasm and pain. Relief of pain was obtained for 10 to 12 hours, permitting a more rapid convalescence, the withdrawal of opiates, and a return to normal diet. Figures I-A and I-B show injection sites along the sciatic and peroneal nerves.

CASE 11. A barber, aged 40, complained of pain associated with a fracture of the right os calcis. He was admitted to the hospital on August 23, 1938, with swelling over the right heel and foot, in addition to pain and crepitus. This condition developed after he had struck the heel violently against a curb.

X-ray examination revealed a fracture of the right os calcis with upward displacement of the fragments. Previous treatment had consisted of medication and opiates.

On August 26, 1938, the patient was given one injection of 3 cc. Aciform II directly into the painful area. There was complete relief of pain for 10 to 12 hours, such relief permitting earlier operative correction and the withdrawal of opiates in the relief of pain.

CASE 12. A general laborer, aged 42, had pain associated with osteomyelitis. In May of 1938, he ran a sliver into his right ring finger with resultant ascending cellulitis and lymphangitis. Although the finger was amputated, the stump area continued to drain and pain persisted.

The condition was diagnosed as osteomyelitis of the right hand and elbow. The disability, at this stage, showed subsidence of the cellulitis and osteomyelitis. However, there was marked muscular atrophy.

X-ray study of the affected area showed no further bone involvement. The right ring finger had been amputated at the first joint; the remainder of the finger was normal in contour.

One injection of 3 cc. of Aciform II was given as a brachial block (as shown in Fig. 5) for the relief of associated pain. The immediate cessation of pain which followed this treatment not only shortened the period of convalescence, but also permitted the withdrawal of opiates. There has been no recurrence of pain over the time of observation.

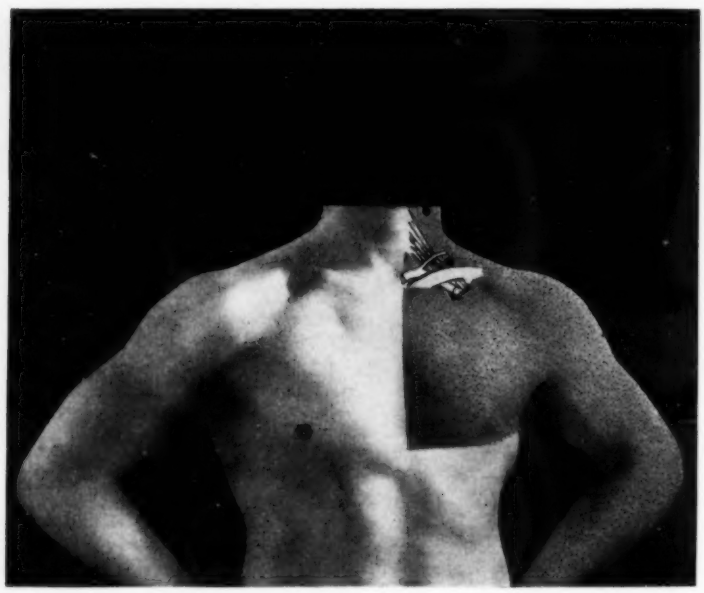

Fig. 5.

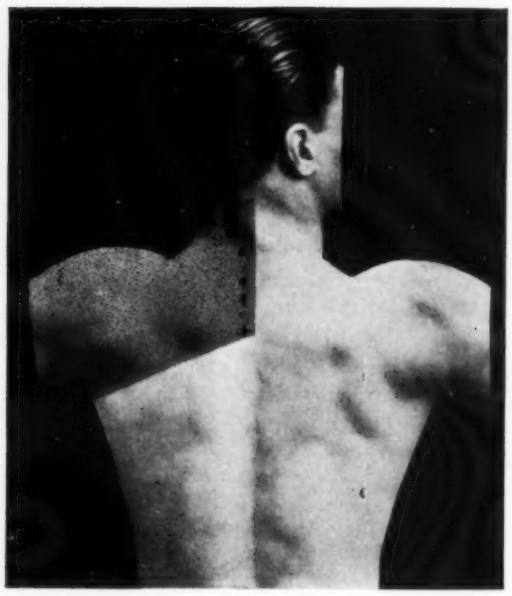

Fig. 6.

Fig. 5. (Case 8): The figure shows the point of injection for performing a supra-clavicular brachial block. The shaded area shows the nerve distribution over the shoulder and left arm. Fig. 6. (Case 16): Posterior view of the neck and upper back showing the points of injection over the posterior thoracic nerve roots and the cervical nerve roots. Also shown is the area of nerve distribution

CASE 13. A lawyer, aged 50, complained of pain and stiffness in the neck, shoulders, arms, and back. Onset occurred 26 years ago and was first evidenced in a severe attack of sciatica. Spondylitis has been present for the last 10 years. Pulmonary tuberculosis, which originally appeared in 1909, recurred in 1918 following a series of five hemorrhages. During this, the last siege with tuberculosis, his weight fell off to 100 pounds.

The physical findings revealed spondylitis involving the cervical, dorsal, and lumbar spines with practically complete ankylosis of the lumbar spine. Marked pain and crepitus were exhibited in the shoulders and the muscles over the shoulders and neck were spastic. His weight at time of examination was 150 pounds.

Roentgen examination of the chest showed healed tuberculous lesions of both upper lobes. X-rays of the back disclosed marked hypertrophic arthritis of the dorsal and lumbar spines.

Record of laboratory examinations showed a leukocyte count over the past two years, averaging 15,000, hemoglobin 97% (16.4 grams) and erythrocytes, 4,830,000.

Previous treatment consisted of diathermy, once weekly for six years; massage, twice weekly for six years; vitamin D, daily for six months; osteopathy, twice monthly for one year; vaccine, every four days for six years; "Hay diet," three years; and change of climate, three months per year.

Vaccine therapy controlled all of his acute exacerbations and relieved the pain in all joints with the exception of the neck. This pain had remained constant for two years.

Aciform therapy was instituted on June 30, 1938, with injections at the sides around the neck and into the shoulders. He received these injections over a period of four months, the treatments spaced a week apart.

The patient secured relief from the pain which eight years of vaccine therapy and the other treatment described had failed to accomplish. He is still continuing with the Aciform II treatment because of the comfort he receives in controlling muscle spasticity.

CASE 14. A businessman, aged 41, complained of acute pain dating from a severe traumatic injury to the back 15 years previously. The back pain had been persistent over this time; also pain in the left leg had been present for several months past. Recent acute exacerbations of pain had been more severe than previously. The only severe illness was typhoid at the age of three. The tonsils were removed empirically in 1926.

On palpation, the patient exhibited acute tenderness and pain in the lower lumbar region, further aggravated by manipulation. There was also acute tenderness over the course of both sciatic nerves. The x-ray findings showed spondylolisthesis of the fifth lumbar vertebra.

Previous treatment had been as follows: Brace, 10 years; salicylates, five years; amytal and codeine for sleep, twice a week for five years; rest, three months; and baths, twice a week for three months.

Aciform II was first given on August 28, 1938, with injections into the gluteal regions as well as paravertebral lumbar injections as shown in Fig. 3. Similar injections were made into the posterior aspect of the left leg as shown in Fig. I-B. Treatments were spaced four days apart and were continued over a period of two months. After the second injection, pain disappeared completely and the muscular deformity was amazingly corrected. Treatment was continued with injections over the course of the sciatic nerves to relieve stiffness.

CASE 15. A housewife, aged 60, complained that, 10 years previously, pain, tenderness, and stiffness in the back, hands, and knees had begun with acute onset. There was steadily progressive weakness and disability. During the course of the disease, acute exacerbations were confined to the hands and knees. The back pain remained constant. The patient's only major illness was an attack of measles during childhood. Despite this history, her tonsils and several devitalized teeth had been removed empirically without benefiting her condition.

Physical findings revealed no demonstrable changes in the joints with the exception of a moderate limitation of motion. Other findings were essentially negative. The diagnosis was hypertrophic arthritis.

X-ray examination of the knee-joints showed definite bony production changes, as well as lipping of the articular surfaces of both tibiae and the patellae. A marked scoliosis in the lumbar spine was a complicating factor.

Previous treatment consisted of massage, weekly for six months; cradle and carbon arc lights, twice a month for six months; contrast baths, twice monthly for two years; diathermy, once monthly for one year; and vaccine every four days for eight years.

While the patient was under regular vaccine treatment, the pain in the knees and hands disappeared and there were no acute exacerbations. The back pains failed to respond to any previous therapy.

Aciform therapy was begun on June 29, 1938, with bi-weekly injections over a period of four months. Injections were given in 1-cc. doses on each side of the lower back, as shown in Fig. 3.

The pain in the back has gradually disappeared. However, the treatments are being continued once weekly for the relief of stiffness, which is now gradually disappearing. Aciform was the first measure to which her back pains made any response.

CASE 16. A physician, aged 63, complained of acute pain and tenderness in both wrists, arms, shoulders, back, and right middle finger. Symptoms were first evidenced in 1908 when there was some joint and muscular involvement following a severe attack of septic sore throat. Intermittent pain with acute exacerbations at irregular intervals continued until 1917 when the middle finger and both wrists became involved. These joints gradually became chronic in character, and more recently, the arms, shoulders, and back became involved.

Our physical findings showed no deformity of the wrists, arms, shoulders, or back. The right middle finger was swollen and partially flexed at an angle of 30°. There was no limitation of motion, nor was there any redness or swelling except in the case of the middle finger. The diagnosis was hypertrophic arthritis.

Previous treatment consisted of the following: Diathermy, twice a week for one year; massage, weekly for three years; vitamin D, three capsules daily for six months; vaccine, every four days for 12 years; change of climate, six weeks; local heat, daily for one month; removal of foci (as below).

There was no change in symptomatology following a tonsillectomy and he was not rewarded for the sacrifice of six devitalized teeth. The palliative measures described benefited him only temporarily. It is our impression that the vaccine therapy controlled his acute exacerbations of pain and stopped the progress of the deformity. Despite the continued use of vaccine, stiffness and pain in the shoulders and lower back persisted intermittently.

The laboratory findings were: Hemoglobin, 106% (18 grams); erythrocytes, 5,230,000; leukocytes, 6,500; urea nitrogen, 10.3 mgs.; sugar, 99 mgs.; cholesterol, 250 mgs.

Aciform treatment was instituted on June 28, 1938. Injections into the shoulders and back were continued every four days over a period of four months, after which treatment was discontinued because all symptoms had subsided.

Case 17. A businessman, aged 45, complained of pain over the lower back and leg along the course of the sciatic nerve for three years. The course of the disability had been progressive. There were no acute or chronic illnesses to account for the onset or course of his complaints. He was never subject to acute or chronic sore throat. Despite this previous history, the tonsils were removed empirically in 1935 with no effect on his sciatic condition.

Physical examination revealed the presence of diffuse tenderness and pain over the gluteal regions and along the course of the left sciatic nerve. The left leg was one-third the size of the right. There was marked atrophy and loss of muscle tone in direct proportion to the diminished size of the leg. Diagnosis was sciatic neuritis with disuse atrophy.

X-ray findings showed bony spurs on the bodies of the lower five lumbar vertebrae. At the fifth lumbar, the interspace was decreased in vertical diameter. There was lipping of the bodies of the fifth and sixth lumbar vertebrae. The bones of the feet showed arthritic changes, but there was no bony destruction.

Previous treatment consisted of the following: Aspirin, daily for three years; diathermy, twice weekly for one year; baths, weekly for three months; osteopathy, weekly for one year; vitamin D, two or three capsules daily for six months; and removal of foci. Intermittent, temporary relief followed previous treatments, but the weakness and muscle atrophy continued to progress.

The laboratory findings were: Hemoglobin, 94% (16 grams); erythrocytes, 4,700,000; leukocytes, 10,500; Wassermann, negative.

Aciform treatment was instituted on August 16, 1938, with injections at points indicated on Figs. I-B and 3. Injections were given every fourth day for a total of eight treatments.

After the second injection, the patient was dramatically relieved of pain. He received eight additional injections after which he was discharged. After the return of normal function in the leg as the result of the relief of pain, the muscle atrophy disappeared and the tone was restored to normal.

Case 18. A businessman, aged 48, declared that 11 years ago, there was a sudden acute onset of pain in the right wrist, both knees, both elbows, and the left shoulder. Pain was present on both motion and rest. The acute attack lasted for six weeks. During the past 10 years, dinner-fork deformities developed in both hands, together with atrophy of the left arm to one-half the size of the right. The left arm became partially flexed at 130°. The last acute exacerbation involved the feet and ankles. There was no previous history of serious illness. The tonsils were removed empirically in 1931 with no change in the arthritic symptoms. Examination: There are dinner-folk deformities in both hands, the grip is broken, and it is difficult for him to touch the palms with the finger-tips. The left elbow is partially fixed at 130° and the shoulder is partially ankylosed. The feet are painful, swelling being marked over the right lateral malleolus. There is pain on motion of the toes, which are moderately restricted. Diagnosis is multiple infectious arthritis with fibrositis and moderate fixation.

Previous treatment consisted of colonic irrigation, once weekly for a year; x-ray treatment to joints, twice monthly for one month; change of climate, six months; infra-red, weekly for 10 years; baths, weekly for 10 years; massage, twice a week for 10 years; hydrotherapy, weekly for 10 years; diathermy, monthly for six years.

The laboratory findings showed hemoglobin, (17 grams); erythrocytes, 4,900,000; leukocytes, 9,400; urea nitrogen, 16.9 mgs.; non-protein nitrogen, 34.6 mgs.; cholesterol, 222 mgs.; sugar, 93 mgs.; creatinine, 1.3 mgs.; uric acid, 4.4 mgs.

On June 28, 1938, Aciform II injections were given and continued twice weekly over a period of three months. Injections were made into the ankles, cervical spine, shoulders, and the left arm. The therapy relieved pain in all joints with the exception of the elbows. Since the pain and swelling in the hands has been relieved, the function has been restored and the grip has returned to 80% of normal.

Case 19. A housewife, aged 60, for 13 years had persistent pain and deformity in the shoulders, hands, elbows, knees, and feet. There had also been pain in the jaws and back. She was persistently demoralized by weakness, fatigue, and mental depression since the onset of her symptoms. The patient never had a major illness or injury in

her adult life. As a child she had measles and mumps. Despite these indications, her tonsils and eight devitalized teeth had been removed empirically without aiding her.

Physical findings: These include dinner-fork deformities in both hands together with swelling about the knuckles. All the deformed joints that were swollen were crepitant. Diagnosis was multiple atrophic arthritis.

Previous treatment: Aspirin, daily for 10 years; vitamin D, three capsules daily for one year; diathermy, weekly for one year; heat and local baths, twice weekly for 10 years; vaccine, every four days for four years; and removal of foci. Under the vaccine therapy, the pain disappeared from the shoulders, hands, wrists, elbows, and feet, but the pain persisted in the knees and back with no change in her gait.

Laboratory findings: Hemoglobin, 92%; erythrocytes, 6,140,000; leukocytes, 11,000; sedimentation rate, 18 mm. per 39 minutes; blood sugar, 117 mgs.; and cholesterol, 294 mgs.

Aciform injections were begun on June 28, 1938, and to the time of this writing, have been given twice weekly for four months. These injections have been directed at the lumbosacral region and knees as indicated in Figs. 2 and 3.

The pain in the back as well as the pain and swelling in the knees has been relieved more in the four months of parenteral acid therapy than during the entire four-year period of previous treatment described.

CASE 20. A physician, aged 69, complained of pain in the lumbosacral region after an acute onset in February, 1938. The pain was intense over the lower back and radiated down the course of the right sciatic nerve to the external malleolus, with intense discomfort, anteriorly and posteriorly. By June, 1938, the pain had so increased in severity that the patient was unable to use the right leg. An eight weeks' period of hospitalization ensued. After intensive, daily treatment over this period, he became ambulatory only with the use of a crutch and a cane. The pain remained unabated and the discomfort was evident on both rest and motion. The patient was restless at night because of pain and resorted to the use of mild hypnotics.

Physical examination revealed muscle spasm over the low right back with a compensatory lateral curvature of the spine. Pain was present over the entire lower back and along the course of the sciatic nerves, more particularly on the right. There was considerable limitation of motion over the back.

X-ray study showed extensive bony spurring on the bodies of the vertebrae in addition to considerable ankylosis of the spine. Bony changes characteristic of atrophic arthritis were shown on roentgenograms of the knees, ankles, feet, and sacro-iliac joints.

Previous treatment consisted of salicylates, three times daily for six weeks; concentrated vitamins, A-B-C, daily for six weeks; diathermy, infrared treatments, daily for eight weeks; physiotherapy (Sitz baths, diathermy, and ultra-violet treatments), daily for eight weeks; removal of foci. This course of treatments was effective only to the extent that the patient became ambulatory with the aid of a crutch and cane. Pain, muscle spasm, and limitation of motion, however, showed only partial improvement.

Aciform II treatments were instituted on October 12, 1938, and were continued over the period of one month with treatments every fourth day. Injections were given along the course of the lower spine and into the gluteal regions as shown in Figs. I-B and 3.

After a month of treatment, the patient discarded both crutch and cane. The spastic muscles were relieved immediately after the second injection. The back is now straight and there is complete freedom of motion in all directions. The patient has been completely relieved of pain over both the back and the right leg and there has been no recurrence over the period of observation. The use of hypnotics for sleep has been discontinued and the patient now notices no fatigue.

The Statistical and Clinical Evidence

THE following compilation and summary represents the results of treatment with this new parenteral acid therapy in our series of 105 cases.

Our experience shows that the parenteral acid therapy used can be safely injected subcutaneously, intramuscularly, and perineurally. Intraneural injections are painful, but these can be avoided inasmuch as perineural injections provide maximum benefits. We have hesitated to inject paravertebrally because of the pain which has been demonstrated in intraneural injections. Epidural injections, in our experience, provide no benefits.

We have confirmed the experiences of others who have investigated this new parenteral acid therapy over a period of years, and we have found no reactions, such as the formation of fibrous tissue or other untoward sequelae.

The patient's willingness to try anything does not release the physician from the necessity of adopting a critical attitude in any therapy and of exercising care to avoid harmful reactions.

Equally important is the physician's obligation to avoid the application of a "favorite" therapy to the exclusion of those in which favorable results have been demonstrated.

It is not uncommon to find well-trained and experienced internists using therapeutic methods and repeatedly ending in failure without investigating the methods used by those who are obtaining results.

Summary

A PARENTERAL acid therapy has been clinically demonstrated by us during the last six months in various forms of arthritis — atrophic, hypertrophic, mixed types, gonorrheal, tuberculous, and rheumatic fever. It has effected favorable responses to treatment and relief of pain in cases representative of these types, as shown in Tables II and III.

TABLE II

RESULTS OBTAINED IN 100 CASES AT THE HOSPITAL CLINIC AND IN PRIVATE PRACTICE

Number of Patients	Diagnosis	Number of Injections	Amount Per Injection in cc.	Complete Improvement (percent)	Marked Improvement (percent)	Slight Improvement (percent)	Negative (percent)
78	Arthritis	4-30	1-3	33.3	43.5	19.2	5.1
7	Sciatic Neuritis	1-6	1-5	28.5	28.5	28.5	14.2
6	Circumflex Scapular Neuritis	1-5	1-3	16.6	50.0	16.6	16.6
3	Lumbago	1	2-3	100.0			
3	Spinal Fusion (Neuritic Pain)	1-4	2-4	33.3		66.6	
1	Acute Arthritis**	4	2	100.0			
1	Bursitis	4	1		100.0		
1	Pain associated with osteomyelitis	1	3	100.0			
100							

** Pain and tenderness with acute swelling and redness of the left elbow. Pain relieved immediately and patient was able to resume work as masseuse on the third day of treatment.

TABLE III

THE RELIEF OF PAIN, PRE- AND POST-OPERATIVELY, WITH PARENTERAL ACID THERAPY, PERMITTING THE OMISSION OF OPIATES

No.	Diagnosis	No. of Injections	Amount per Injection	Response
2	Fracture Os Calcis	1-2	1-3	Pain relieved 10 to 12 hours
2	Fracture Tibia	1-2	1-3	Pain and spasm relieved for 10 to 12 hours
1	Hallux Valgus	1	5	Pain relieved for 12 hours

In a total of 105 cases seen over a six months' period, 32.3% showed complete improvement; 42.8%, marked improvement; and 19%, slight improvement. In only 6.7% of the cases were the results negative.

This treatment, it is to be emphasized, is in no sense a panacea, nor is it advanced as the ultimate in the treatment of arthritis. However, in our experience in testing 105 cases, it has evidenced a superiority to other forms of therapy in: (1) rapidity of action; (2) absence of reactions; and (3) safety.

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New Books

Review by

FREDERICK W. SLOBE, M.D., F.A.C.S.

MANAGEMENT OF FRACTURES AND DISLOCATIONS by Philip D. Wilson, M.D. Published by the J. B. Lippincott Company, New York.

This work is by the staff of the fracture service of the Massachusetts General Hospital and is based on an analysis of 4390 cases of fractures and dislocations. Dr. Philip D. Wilson is the general editor with the following collaborators: Drs. Allen, Bach, Barr, Cave, Daland, Harmer, Hodgson, Jones, Kazanjian, Leland, Marble, Parsons, Reggio, Roberts, H. Rogers, W. Rogers, Scudder, Smith-Peterson, Sowles, Taylor, Van Gorder, and Young. Of the 1419 illustrations in the text, 1192 are small line tracings of roentgenograms.

As explained in the preface, the analysis is of specific cases and not of abstract methods. It covers the period from 1923 to 1930. During this period there were 3985 patients with 4392 fractures and dislocations. The book is based on the study of 1573 hospital cases of which the end result after one or more years was obtainable in 75%. The hope is expressed that a physician with a specific case in mind will find its counterpart in one of the cases described in the book. The editor modestly states: "We are neither proud of our results nor ashamed of them, but present them for what they are worth as a matter of actual opinion. Let anyone who wishes to criticize or claim better results present his actual consecutive experience with the results as critically appraised as these and we shall be glad to profit from the comparison."

Of the total, 44% were hospitalized. All the compound fractures were admitted to the hospital even those confined to a toe or finger; also all fractures of the shaft of a leg bone with displacement. Ninety-nine of 1573 house cases died but of this fatal group 44 were head injuries and 37 were fractures of the neck or trochanter of the femur. Of the house cases 25% were operated on. The incidence of nerve injury was only 0.5%.

Each of these cases is analyzed as to end results and also graded from three separate view points: anatomic restoration, functional recovery, and effect upon economical ability, each of which is graded on a numerical basis from 1 to 4, A_4 F_4 E_4 constituting a perfect result.

In the fractures of the hand the use of flat splints is decried, emphasis being placed on early function of the fingers, opposition and abduction position of the thumb, and elastic traction by a pin through the distal phalanges in cases of displacement.

In the section on the wrist, for disability caused by nonunion of the scaphoid the bone graft operation is preferred and this operation is illustrated. For semilunar dislocations closed or open reduction is advised wherever possible, the excision of the bone being avoided unless it is dead. For fractures of the lower end of the radius general anesthesia is preferred for reduction, the average splint being on about three weeks although motion is started before that time, the early use of the wrist being emphasized.

The frequent disability resulting from fractures of the head and neck of the radius is stressed. Many of these were operated upon, the excision of the head giving the best results particularly if performed early. In forearm fractures traction is considered to give the best results in the upper third but not so effective in the lower third where traction is obtained by a glove glued to the hand and allowing the fingers to remain comparatively free. Quite frequently the straight arm cast is used with the elbow in extension. Because of the fact that one almost always finds a fracture or dislocation of the radial head

when there is an overriding fracture of the shaft of the ulna and a disalignment of the wrist joint with an overriding fracture of the shaft of the radius, open reduction is necessary for accurate reposition of the fractured shaft in order to assure good elbow function in the former and good wrist function in the latter. In olecranon fractures operative treatment is advised when there is any displacement of the fragments, the fascia lata operation being preferred.

In super-condylar fractures of the elbow, because of the dangers of circulatory and nerve involvement, immediate reduction is necessary and if the condition is not satisfactory fasciotomy and open reduction are advised. Open reduction is also advised in fractures of the capitellum and lateral condyle in children if the fragment is rotated. It was noted that most nerve palsies following elbow injuries cleared up spontaneously.

The variety of methods in current use in fractures of the humerus is said to be most contradictory. In transverse fractures manipulation and fixation methods are used by either open or closed reduction. In oblique fractures after reduction the position is held by traction and where secondary operations are needed bone grafts are found to bring the best results; it is felt that threatened non-union could be suspected early enough to save considerable time. Radial nerve injuries are found not to cause much permanent loss because of spontaneous improvement.

In shoulder dislocations the final results are not deemed to be satisfactory chiefly because of the inadequate after care and delay in active motion, and because of complicating soft tissue injury.

For fractured clavicles the figure-of-eight plaster bandage is preferred. Acromio-clavicular dislocations are usually treated conservatively, the opinion being divided as to open operation except for men doing heavy labor where it is sometimes indicated.

In compression fractures of the spine general anesthesia is not advised for reduction because of the danger of cord injury. This is in marked contrast with the procedure in common usage in the middle west. Reduction is obtained by gradual hyper-extension on an elastic Bradford frame followed by an ambulatory plaster body cast left on for four months. Fracture-dislocation of the cervical spine is briefly covered as only eight cases are enumerated.

There are 161 cases of head injuries out of which 27% died (of the fatal cases one-half died in 24 hours). There are 11 sub-dural hemorrhages and two extra-dural hemorrhages all of which, of course, are operated on. Adults are usually disabled about three to four months. A mid-conservative procedure is followed utilizing spinal puncture, dehydration measures, and careful observation. Where sub-dural hemorrhage is expected there is no hesitancy in performing a bilateral trephine if no hemorrhage is found on the first side. A few osteo-plastic flaps are used. In addition to the 13 operations listed above there are 16 operations for depressed fractures and six decompressions. Fractures of the facial bones are described by numerous diagrams and descriptions of apparatus.

Conservative measures are utilized in the treatment of fractures of the pelvis by sling suspension, webbing belts, or the Bradford frame. Associated urethral and bladder injuries are described with only moderate detail.

Metatarsal fractures are treated by the plastic boot, by elastic traction with a pin through the distal phalanx, or by operation for persistent displacement.

In treating fractures of the os calcis emphasis is placed on bringing the heel process back and down and reducing the lateral bulging; this is usually by skeletal traction and clamp pressure. The routine tenotomy of the tendo-Achilles is condemned because of the probability of causing some persistent muscular weakness. Because complete reduction is so rare, subastragaloid arthrodesis is frequently used because it eliminates pain in the involved joint, the valgus deformity is corrected by using the Hoke method or some similar procedure, and the protruding lateral bone can be excised. In the milder cases the ambulatory plaster cast is used for eight weeks.

In ankle fractures early reduction, early motion, and early weight-bearing are said to be important. For single bone fractures the ambulatory plaster cast is used but for both bones the plaster cast with the knee flexed is used; operation is needed occasionally.

For both bones of the leg, although closed reduction by plaster cast is satisfactory for children, it is not sufficient in most instances occurring in adults where skeletal traction is often utilized or, after reduction, by casts and transfixed pins with the use of one of the mechanical appliances. It is important to immediately reduce these fractures. In 12% delayed union or pseudarthrosis occurred, caused by or influenced by incomplete immobilization and distraction of the fragments. In fractures of the tibial tuberosities closed manipulation and casts are used for the simpler cases, operative reduction being used only after failure of several earnest attempts. For fractures of both tuberosities with considerable displacement, heavy skeletal traction on the os calcis and molding of the fragments manually or with a clamp with subsequent suspension and traction yielded the best results.

In femur fractures when the lower end is involved the condition is treated with skeletal traction through the tibial tubercle with the leg in partially flexed suspension and with the occasional addition of molding with a carpenter's clamp. Operation is occasionally resorted to. In shaft fractures skeletal traction is considered more reliable than adhesive traction in adults. The frank admission is made that operative results are not good, apparently due to the fact that the work is performed by a large number of surgeons and not by a specialized group.

For inter-trochanteric fractures both adhesive and skeletal traction and suspension are used; the Roger Anderson apparatus is considered satisfactory in some cases. Closed reduction and plaster casts are not advised and open reduction is not advised. In fractures of the femoral neck, in 83 treated by the Whitman method, union took place in 25 out of 33. The mortality is 26%.

Forty-seven cases of pathological fractures are listed including 15 different lesions. The opinion is expressed that simple cysts may be extinct giant cell tumors. Where the x-ray is indefinite biopsy is advised.

In the chapter on delayed and non-union the predisposing factors are listed under five groups including physiological, chemical, therapeutic, mechanical, and pathological. It is many times impossible to distinguish between delayed and non-union. It is said that where distraction is not completely corrected in two weeks operation is indicated. To obtain union it is important to obtain early reduction, complete immobilization, and assurance of adequate blood supply. Delayed union is often very prolonged in the forearm; and non-union of the ulna is frequently not incompatible with good economic restoration.

As pointed out by the editor, this book is not a treatise discussing most of the various methods of treating a given fracture but rather an analysis of a large series of cases treated by a local group. Because each chapter is written by one individual there is usually one method which is given precedence over the others and thus there is much repetition in the method of handling one type of fracture. When a surgeon becomes well versed in a method in which he obtains good results it is only natural that he maintains the use of that method until he finds something superior. The length of disability is usually given and this together with the end result gives one an excellent summary of the results obtained. The profusion of x-ray sketches gives one a clear mental concept of the type of fracture. Great credit is due the authors for the tremendous amount of care in detail and the amount of time spent in giving a complete though brief summary of each case. If one has a fracture to treat the chances are that he will find its replica in one of the cases described. Decidedly different and unique, this work is a most valuable addition to the literature on fractures and dislocations.

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The First Congress

NO ONE can read the account (on pages 64 to 73) of the Industrial Health Congress, held under the auspices of A.M.A. at Chicago last month, and fail to perceive that the field of medical practice known as industrial medicine, and the men in that field, had earned and deserved long before they got it the recognition which the holding of the Congress afforded them. The fact came forward in every one of the four sessions; it was repeatedly emphasized in the numerous ways in which such emphasis is possible short of positive assertion—conclusion, contrast, historical background, statistics, and even the occasional flare-up of the almost burned-out embers of ancient resentment on the part of those who are not in industry toward those who are.

All in all, however, the Congress was a step forward, and a big one. It began with a little of the feeling that it was an experiment, but it ended with the consciousness of something important and vital accomplished—not the least of the elements of the accomplishment being a vastly enhanced mutuality of appreciation and respect as between the industrial medical men and the general practitioners. It is regrettable that there wasn't an overwhelming preponderance of the latter among the registrants. But there will be a second annual Congress, and thereafter a succession of Congresses. And it is to be hoped that the attendance will be increasingly representative of those who must be increasingly depended upon by the industrial physicians, if they are to make the next 25 years of industrial medicine as important and useful to all of the 50 million who are gainfully employed as it has become to the substantial proportion who have been helped by industrial medicine in the first 25 years of its growth and development.

The Knudsen Award

DR. SHOUDY'S Committee has pretty well defined the conditions of the KNUDSEN AWARD for "the most outstanding contribution to industrial medicine." The award "shall be made to the member (of the A. A. I. P. & S.) submitting a monograph, paper, or book, on some phase of medicine as applied to industry, showing original research and investigation."*

Clearly, therefore, it is up to the members—and now they are nearly a thousand in number—to submit such of their matters of work, and interest, and pains, and pride as they would like to have considered. Let no modesty withhold. Only one can win the honor, but the significance of this award is such that it will be also an honor to have been among those from whom that one is chosen.

Who's Who Now!

WHEN our first edition of WHO'S WHO IN INDUSTRIAL MEDICINE AND TRAUMATIC SURGERY was published, in 1936, there were many who should have been included but were not because they did not want, at that time, to be definitely identified with industrial work. Others chose to stay out because they had some thought that the book would prove to be "just another directory."

But three years have seen a remarkable change in both of these respects. As to the one, the industrial identification—from causes that need not be gone into here—has become rather more a matter of pride and much less a matter of reluctance. And as to the other, the book *was* a WHO'S WHO in every respect of form, content, manner of presentation and manner of disposal. It was creditable in all respects. And it has found a wide use as an authoritative reference work—the last year, particularly, has seen it more largely availed of and depended upon than ever.

And now there is the demand for a second and enlarged edition. This comes, in the major part, from those who withheld their biographical data until after they saw the book, and in almost equal proportion from the newer men in industrial medical relations.

Accordingly, the preparation of the second edi-

* See INDUSTRIAL MEDICINE for January, 1939, p. 44.

tion, the WHO'S WHO of 1939-1940, has been started. It will be our aim to include every M.D. who is identified with industrial medical work in any way—full-time, part-time, or as a consultant. And our definition of industrial medical work embraces, as to "industrial," *all* who are gainfully employed and because of that fact have any reason to be under the preventive or curative supervision of medical science. The book will emphasize identification of the field of industrial medicine, rather than selection within the field. There is no price upon inclusion, no requirement to buy a book, no advertising. The compilation and presentation will reflect the dignity of the most dignified, and, we hope, attain the accuracy of the most meticulous.

The difference between Who was Who in 1936 and Who is Who now is the difference that reflects an appreciation of full stature and maturity arrived at meanwhile, together with the strong and assured touch of an independence which, being *fait accompli*, needs no declaration.

INDUSTRIAL HEALTH AND DISEASE

The Common Cold

IN THE *American Journal of Public Health*, January, 1928, VOLNEY S. CHENEY, M.D., explained the cause and cure of the common cold.* He was then medical director at Armour and Company. Each worker lost about 1.5 days a year because of colds. The cold was a product of civilization. The term is lay language for what doctors call acute coryza, rhinitis, pharyngitis, laryngitis, bronchitis, la grippe, influenza, or tonsillitis, depending upon the doctor and how much the patient can afford to pay for a big word. There was a dearth of research on the subject, except efforts to find the primary infective agent, yet 45% of all industrial absenteeism was due to colds and their sequelae, i.e., "an acute infection of the nasal and pharyngeal regions, or of the upper respiratory tract." No specific bacteria had been indicted; why not study beyond bacteria then? Colds are not infectious. (Opinions differ about this.) Climatic factors contribute only in so far as they inhibit normal activities and decrease protein utilization. We eat too much and exercise too little in cold weather. Lumber camps are free from colds in winter.

Now we are getting somewhere. Cold incidence is always high on the day following a banquet. Fatigue or deranged metabolism is a contributory factor then. Cold is a symptom. The syndrome: Urine abnormally acid; tendency to blood acidity; metabolic rate low; decrease in blood bicarbonate; slight increase in blood sugar and nonprotein nitrogen; nasal and throat sections less alkaline than usual. Hence the administration of ammonium and calcium chlorides to induce acidosis will produce the cold syndrome; severe acidosis equals influenza! But administer sodium bicarbonate via mouth or rectum and the symptoms subside. If alkalinization is induced at the first sign of throat dryness colds can be aborted; use 60 grains of sodium bicarbonate in a large glass of hot water every two hours for three doses and one grain of calcid (calcium and iodine) each one-half hour for six doses—and a cathartic. *Voila!* It is harder to cure the cold after it really gets under way. Conditions that produce mild acidosis, like stuffing with Sunday dinner and sleeping it off, and disturbed blood buffer action, plus poorly balanced diet, lack of exercise, fatigue, constipation, and possibly infections cause colds. There is no kidding about this. Maybe the doctor was right. What do doctors think now? It is always useful to look into the past—useful, informative, sometimes embarrassing.

* From *Medical Record's* "Critique," January 19, 1938.

In the News

DR. STERLING B. TAYLOR, Chief Surgeon of the New York Central System, at Columbus, Ohio, announces his retirement from that position after 38 years of railroad surgical service. On January 5, more than a hundred of his friends gathered together, from the community and the railroad, and made the luncheon in his honor a testimonial to his outstanding career as a surgeon and his fine character as a man, a citizen, and a friend.

THE Committee on Organization of the American Conference on Occupational Diseases and Industrial Hygiene now includes CHAS. L. POOL, Chief Engineer of the Division of Industrial Hygiene, Rhode Island Department of Public Health, Providence, who was recently appointed to its membership.

A REPORT asserting that 18,000,000 persons in the United States have trichinosis, the worm disease from eating under-cooked pork, was made (A.P. January 24) to a conference of New York and New Jersey health officers. The report was made by Dr. Thurlow C. Nelson, head of the department of zoology, Rutgers university.

ONE could write a book on the searching health examinations given the air personnel.* The optical side is really extraordinary, including such delicate tests as depth perception. As to pilots, naturally, a man cannot be allowed to fly if he is not fit, but the attitude even here is not so much a "barrier" as it is one of helping the man keep fit. And that carries over into another part of the plant, to the attitude in regard to the "Link Trainer" where pilots practice blind flying.

* From an article on United Air Lines Employee Cooperation, by ROBERT F. MUNGER, in *Chicago Daily News*.

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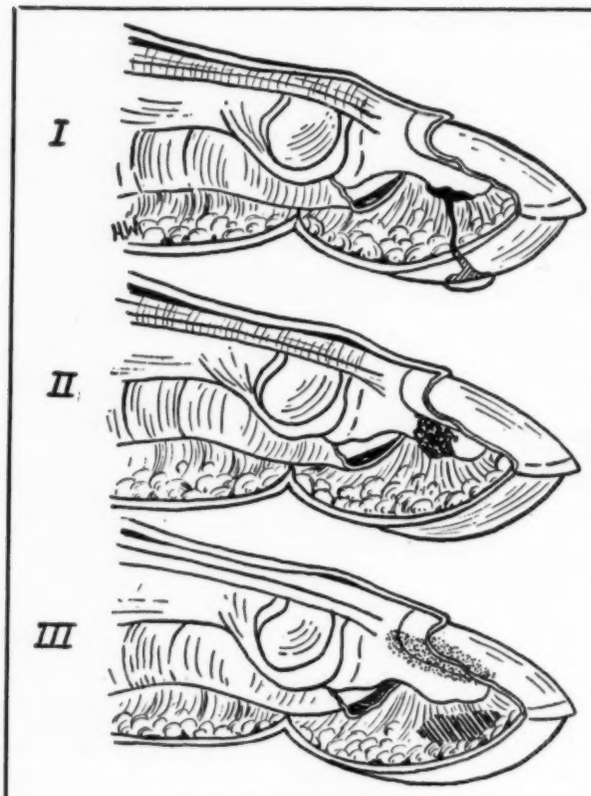

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READER'S DIGEST for February, 1939, under the title "Unsung Heroes of Public Service—II," has a half page by Albert W. Atwood on DR. ROYD RAY SAYERS.

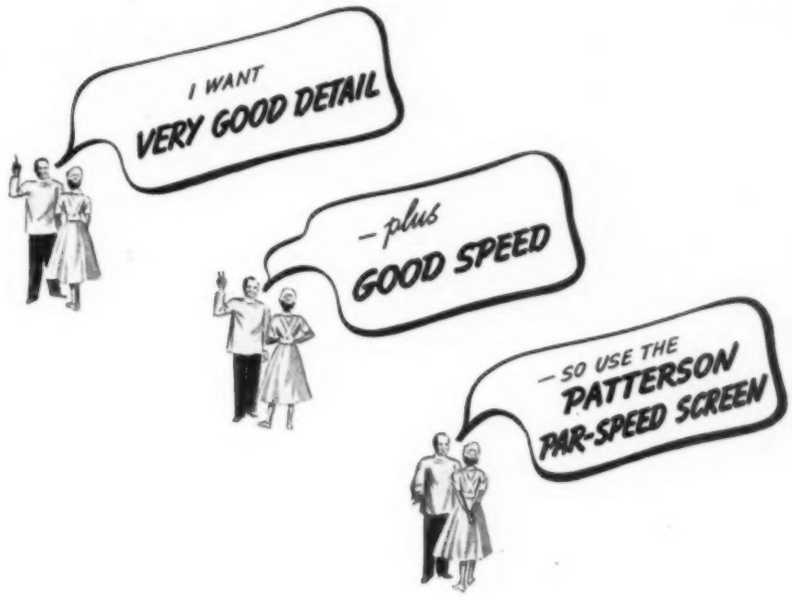
From the Archives

ORGANIZED labor for more or less obvious reasons has opposed routine or regular physical examinations, particularly pre-employment examinations.* They have not seen fit to resist or campaign against regular periodic examinations of employees while they are working. There is perhaps some justification for the feeling on the part of organized labor that pre-employment examinations are used as a basis for excluding some people from work. That no doubt has happened. One of the greatest problems in connection with routine pre-employment examination is that only a small percentage at most of a total available group of workmen can be technically classed as without defects. Granted that an intelligent type of management would examine employees and make a sincere effort to locate them in the position for which they are fitted I don't believe there would be too much abuse or too much of a question raised. There are other advantages from the point of view of labor, such as proper job placement. It certainly is best and desirable that, for instance, a very short man of light weight be allowed to do the kind of work that he is best fitted for and not thrown in with a group of large men doing arduous work. That certainly is logical. Then too the pre-employment examinations are necessary if any degree of control of communicable disease is effected. That is just an ordinary part of any public health program. In addition to that, as mentioned before, aggravation of existing though unrelated diseases or even potential hazards does become a cost to employers and they certainly cannot be taken to task if they are interested in what their experience is going to be in that respect.

(Continued from page 1)

great deal to elevate the plane of traumatic surgery." And many others. . . . JUST to keep the record as free as possible from inadvertences, DR. MOCK's statement as to 20 railroad surgeons' associations now existing, "where there were none 30 years ago," overlooked the fact that in 1939 the American Association of Railway Surgeons will hold its *Fiftieth* Annual Meeting, and that in 1939 the Association of Surgeons of the Southern Railway System will hold its *Forty-Second* Annual Meeting. . . . LAST year, at an Occupational Disease Symposium, DR. FISHBEIN said that industrial medicine might well be considered a specialty in about 25 years. His prophecy, however, contained a fact. It is 25

* From a Round Table Discussion of May, 1937.



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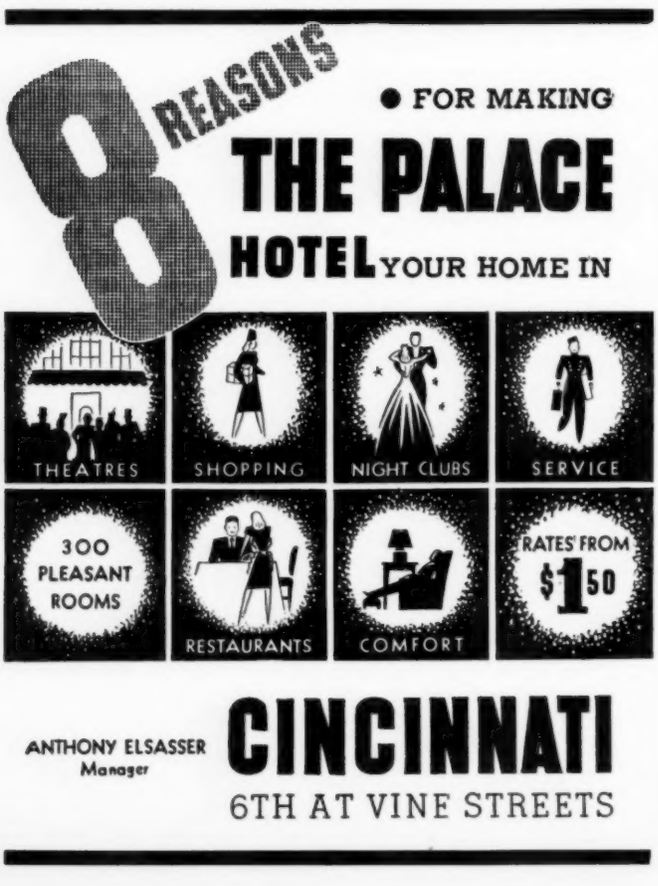
years since industrial medicine had its beginnings, and industrial medicine *is* a specialty, in the sense that it is a special field of the practice of medicine. In 1940 the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS will hold its *Twenty-Fifth* Annual Meeting. . . . MEANWHILE it is well to remember that its Twenty-Fourth Annual Meeting will be held at Cleveland, Ohio, June 5, 6, 7, and 8, 1938, with the AMERICAN CONFERENCE ON OCCUPATIONAL DISEASES AND INDUSTRIAL HYGIENE. It is not too early, therefore, to say: "See you at the Convention." The response of exhibitors to the initial announcement indicates already that there will be many interesting exhibits there to see. And *we* are going to have some Convention Issues of our own. But more about those later. . . . BY all means, look on page 33 of *Reader's Digest* for February, and read what Albert W. Atwood says about DR. SAYERS. It is a tribute well deserved. We probably will not infringe the copyright if we quote: "He is the key man in the rapidly growing movement to prevent and cure occupational diseases. . . . He is the leader in discovering the best way to deal with the hazards of their daily jobs and he is the most influential man in getting preventive measures adopted." All of that, and more, as those who know him know. . . . INCIDENTALLY DR. LANZA'S new "Silicosis and Asbestosis" is advertised on this page, and DR. SAPPINGTON'S new "Medicolegal Phases of Occupational Diseases" on the last page. Both are timely and important books. Order Now!



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